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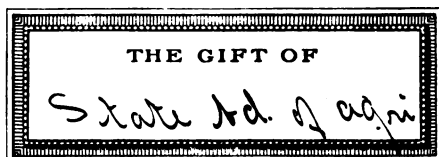
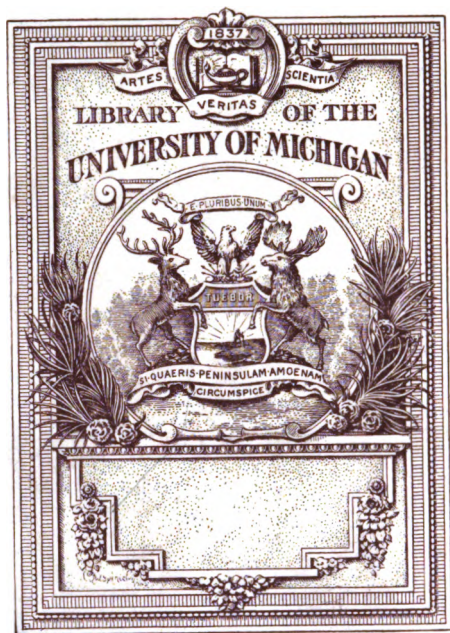
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ANNUAL REPORT
OF THE
NEBRASKA
STATE BOARD OF AGRICULTURE.

1886.

By ROBERT W. FURNAS.



ANNUAL REPORT

NEBRASKA

State Board of Agriculture,

FOR THE YEAR 1886.

PREPARED BY

ROBERT W. FURNAS,

Secretary Nebraska State Board of Agriculture.

LINCOLN, NEB.:

STATE JOURNAL COMPANY, PRINTERS.
1887.

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JAN 12 1887
STATE BOARD OF AGRICULTURE, }
OFFICE OF SECRETARY, }
BROWNVILLE, NEBRASKA, Jan. 12, 1887. }

His Excellency Hon. John M. Thayer, Governor of Nebraska:

SIR—In compliance with law in this case made and provided, I hereby transmit the annual report of the Nebraska State Board of Agriculture for the year 1886.

Very respectfully,

ROBT. W. FURNAS,

Secretary.

PROCEEDINGS.

ANNUAL MEETING, 1886.

FIRST DAY.

LINCOLN, NEB., Jan. 19th, 1886.

In compliance with provisions of law in this matter made and provided, the Nebraska State Board of Agriculture convened in the hall of the House of Representatives, this day, at 3:30 o'clock.

Officers present—

J. B. DINSMORE, President.

R. DANIELS, First Vice-President.

F. H. HOIT, Second Vice-President.

C. HARTMAN, Treasurer.

R. W. FURNAS, Secretary.

W. R. BOWEN, General Superintendent.

A. HUMPHREY, Assistant Superintendent.

H. B. NICODEMUS, Superintendent Gates and Tickets.

O. M. DRUSE, Master Transportation.

Roll called. The following members of the State Board present :

L. A. KENT,

R. W. FURNAS,

H. B. NICODEMUS,

O. M. DRUSE,

W. BARSTOW,

E. N. GRENNELL,

ED. MCINTYRE,

J. JENSEN,

J. B. McDOWELL,

E. A. BARNES,

S. M. BARKER,

R. DANIELS,

D. V. STEVENSON,

J. B. DINSMORE,

DAVIS RICHARDSON,

J. M. BURKS,

H. D. KELLY,

D. H. WHEELER,

(5)

CHRIS. HARTMAN,	M. DUNHAM,
R. R. GREER,	R. H. HENRY,
W. E. HILL,	W. R. McCULLY,
C. W. CONKLIN,	FRANK H. HOLT.

On motion, Wheeler, McCully, Grennell, Greer, and Barstow were appointed a Committee on Credentials of representatives from county societies.

Mr. McIntyre moved that district agricultural organizations in this state be included with county organizations.

Mr. Dunham moved to amend that representatives be extended the courtesies of the floor, with right to participate in all discussions, but no vote.

The amendment prevailed, and motion as amended adopted.

The Committee on Credentials in due time reported the Presidents or Delegates from county societies present and entitled to seats as follows:

Adams—W. T. PUTT, Delegate.
Antelope—E. S. BUTLER, President.
Boone—LORAN CLARK, Delegate.
Brown—G. R. GLOVER, President.
Buffalo—H. A. LEE, President.
Burt—J. R. SOUTHERLAND, Delegate.
Butler—D. B. ARMAGOST, President.
Cass—FRED GORDER, President.
Cedar—M. S. MERRILL, President.
Clay—M. S. PRICE, President.
CUSTER—F. H. YOUNG, Delegate.
Dawson—C. H. BALLINGER, Delegate.
Dodge—W. L. MAY, Delegate.
Douglas—JOHN T. PAULSEN, President.
Fillmore—J. JENSEN, President.
Franklin—E. H. MARSHALL, Delegate.
Furnas—JOSIAH CARMEAN, President.
Gage—JOSEPH ELLIS, President.
Gosper—H. H. BRUNSTETTER, President.

Hall—E. A. BARNES, President.
Hamilton—F. H. STEVENS, President.
Harlan—L. H. KENT, Delegate.
Hitchcock—W. D. WILDMAN, President.
Howard—ADAM BRICKER, President.
Holt—J. SKIRVING, President.
Jefferson—W. W. WATSON, Delegate.
Johnson—THEO. SMITH, President.
Kearney—LEVI L. COPELAND, President.
Knox—GEO. A. BROOKS, Delegate.
Lancaster—A. HUMPHREY, President.
Madison—S. W. RICHARDSON, Delegate.
Merrick—D. W. BESS, Delegate.
Nance—B. D. SLAUGHTER, Delegate.
Nemaha—R. W. FURNAS, Delegate.
Otoe—G. W. MCKEE, President.
Pawnee—S. A. HARTWELL, President.
Pierce—W. E. BISHOP, Delegate.
Polk—S. B. MOFFIT, Delegate,
Richardson—JULIUS SMITH, President.
Saline—C. J. BOWLBY, President.
Sarpy—R. DANIELS, Delegate.
Seward—W. GILL, Delegate.
Sheridan—D. W. MOFFITT, President.
Thayer—C. B. COONS, President.
Valley—S. H. WEBSTER, President.
Washington—E. S. GAYLORD, President.
Wayne—WM. FRAZIE, President.
Webster—J. C. WARRINER, Delegate.
York—H. FRY, Delegate.

President Dinsmore read the following annual address, which, on motion, was referred to a committee consisting of Wheeler, Furnas, Nicodemus, Kelly, and Grennell, for apportionment, and recommendation for action as to his suggestion :

PRESIDENT'S ADDRESS.

Gentlemen of the State Board of Agriculture :

A year has passed since we last met in annual meeting. Many of you have felt that the ever-increasing cares and responsibilities of a busy life have borne heavily upon your time and strength. Some of you, no doubt, have felt that you could not respond to any further calls upon your already over-burdened time. Still, to each appeal for help you have come manfully to the front and sustained me with your council, advice, and assistance. But for the ready and cordial support you have at all times extended, I should have often felt that my responsibility was too great. A year ago, by your vote, our annual fair was located in this city. To many of you this looked but the beginning of the end, and that end to be disaster, if not ruin, to the Society. From the hour when that ever-memorable ballot was taken, those closely connected with the active management of the affairs of the Society were aware that greater exertion must be put forth than ever before to secure results that should enable those of you who voted to locate here to point with pride to the most successful exhibit ever made under the auspices of the Society; to show a balance in the treasury that should for ever put to rout the assertion so often made, in and out of our meetings, that the Society could not hold a fair so far inland and make the same a success. To all who have thus argued, the late fair was a most absolute denial of the argument. The phenomenal success attained by our late fair is the subject of conversation and congratulation wherever the subject of fairs is talked of. There are many elements that entered into and made possible the great success, among which may be mentioned the generous and liberal aid rendered by the citizens of Lincoln, by which the commodious buildings, sheds, and pens, as well as the admirable grounds, were furnished without cost to the Society. Not only did they furnish everything they agreed to, but much more. The generous and courteous treatment extended by the railroads of the state made it possible for the exhibitors and guests to attend at the smallest outlay of time and money. Never were there so many citizens of the state who are engaged in the various branches of agriculture present at any one fair, all of whom I hope carried home some lesson that shall be of practical use in solving questions met in everyday life on the farm or in the shop. The people of the state, as did the stranger from beyond our border, came forward with exhibits in number, extent, and variety far exceeding anything ever witnessed at any former fair. Gathered from far and near, the handiwork of the child of six or eight years, as well as that of the octogenarian, the produce of him who counts his possessions by eighty acres, and he who has an entire section of land. Magnificent as all this was, I confidently expect to see it eclipsed in the near future. The people of our own, as well as other states, are aroused to the fact that this state of ours is no longer in its infancy, but is fully grown; that its citizens not only know what they want, but that they have ready cash in hand, or money deposited in King Corn's bank, with which to honor any drafts made upon them for stock with which to improve the common herds, studs, or flocks of the state.

With this appreciation of our wants, exhibitors of live stock will come from far and near to dispose of their surplus, for all of which adequate provision must be made by you for shelter and water.

Ample and complete as were the grounds, buildings, sheds, and pens, experience

teaches that in many particulars improvements cannot only be made, but are absolutely demanded, among which I would mention the arrangement at the entrance gate, the amphitheater, police quarters, the improvement of which should be referred to and receive the most careful and earnest consideration of the Board of Managers.

Experience teaches that the methods of judging in the live stock departments, as heretofore practiced, is open to many grave objections.

It often happens at the last hour that the judges selected to award the premiums are not to be found. The class superintendent must then hastily gather up a committee from such material as is then at hand, sometimes good, but very often bad. At times we find men judging improved stock that could not tell the difference between a Short-horn and a Polled-Angus, a Percheron and a Clydesdale, all of which is wrong.

I would recommend that in the future we adopt the one judge system; employ and pay the most competent man to be found for the various classes of live stock, changing in sweepstakes. By so doing merit is more apt to be rewarded. You who have been honored by being elected members of this Society should from this day so plan to arrange your business that when the day comes that our gates are open for the reception of exhibits, that you are all here, ready and willing to perform any task, however arduous and difficult, that may be assigned you, and show that the confidence reposed in you at the time you were elected to membership in this body was well founded, that your faithful labors may be suitably rewarded and you promoted to more favorable stations. If this is done the more active management of the fair can be systematized so as to run without friction or jar.

I now wish to call your attention to the magnitude of the labor incident to the proper discharge of the office of Secretary. Year after year his labors have increased until I doubt if one could keep up with the work devoting his entire time thereto. For the last two years our Secretary has had to take various members of his family from their usual avocations to help him, that the work of the office might not suffer. This extra help he has paid from his salary. That you may form some idea of the labor, I would say that there have been 7,270 letters written and mailed, 3,124 postal cards, 15,904 single premium lists and circulars, leaflets, etc. The report of the proceedings for the year 1885 amount to 1,100 pages of closely written manuscript.

Let us compare the Secretary's salary with that of some of our neighboring states and note the comparison: Iowa pays her Secretary, John R. Shaffer, \$2,200, from which he pays office rent, fuel, and lights, which reduces his salary to about \$1,800, he says. In addition to this he is allowed one clerk at \$600 per year, and all necessary help during the holding of the fair.

Illinois appropriates for her Secretary as follows, viz.: Salary, \$2,400; clerk, \$1,500; porter, \$600. He is also allowed the services of a curator, with a salary of \$600, who has charge of the museum.

Kansas pays her Secretary \$2,000 per year, necessary clerk hire, office rent, traveling expenses, etc.

Minnesota pays \$1,500, and necessary help at time of fair. Thus you will see that the average salary of the four states named is \$2,900, as against \$1,000 paid by us. Are we paying enough for the services required? I leave this for your solution, hoping that it may not be said that we are not justly liberal with those we require the most of.

I would call your attention to the International Association of Fairs, which has for its object the comparing of views upon all subjects relating to the management of fairs. This society holds its second annual convention at Indianapolis, Ind., Wednesday, February 3, 1886.

The membership fee is \$10, also annual dues of the same amount, I think. Each society holding membership is entitled to three representatives, and but one vote on all questions.

From the broad scope indulged in the consideration of subjects, I am convinced that great good would come from our being represented by a membership and delegation.

I would recommend that steps be taken for the appointment of delegates to and the securing of membership in this association.

I would also recommend that steps be taken to secure membership in the National and Consolidated Cattle Growers' Association, as through their influence we are to look for national legislation for the suppression of pleuro-pneumonia and kindred diseases.

As the live stock interest, in point of dollars and cents, is far greater than any other branch of agriculture, we cannot withhold our pittance in the way of influence, and expect our representatives in the national legislature to give that force to their exertion in favor of legislation that they would if spurred on by the knowledge that their agricultural constituency were thoroughly in earnest in their demands for such action on their part.

As the time has arrived when I am for the second time to return to you the office with which I have been honored, I wish to return thanks for the courteous and considerate treatment I have uniformly received at your hands. Each of you has proved by your acts that the success of the Society, and not his individual aggrandizement, was the aim sought.

Secretary Furnas presented his Annual Report as follows, which on motion was referred to the same committee as President's.

SECRETARY'S REPORT.

To the President and Members of the Nebraska State Board of Agriculture:

In compliance with provisions of the law, I hereby submit, for your consideration, my annual report as secretary of the board, for the year 1885.

That the nineteenth annual exhibit, held by the board September 11 to 18, was in all respects a grand success, goes without saying. The weather was fine, the exhibit installed and the attendance all that the most sanguine could desire. The arrangements and preparations of the grounds on the part of the enterprising people of Lincoln were the very best money and labor could produce, and all who attended went home pleased.

STATISTICS AND INFORMATION.

Permit the respectful suggestion, that the time has arrived for the board to take another step forward. Something more than the annual fair should be embraced in its work. True, these exhibits and gatherings of the people in themselves are wonderful educators and productive of much good. Still there should be record

matter for reference and preservation. Statistics referring to products, resources, promises, and prospects of the state, should be collected, carefully prepared and circulated. To show the demand for such information, I state a fact, that since my return from New Orleans in June last, I have replied to 3,425 letters from outside the state, and not connected with my official duties as secretary of this board, asking for statistics and general information concerning the state.* In most of the prosperous agricultural states, bureaus of statistics have been organized and monthly bulletins issued. In fact, in several states, the state boards of agriculture have ceased holding fairs and turned their attention entirely to obtaining and diffusing statistical information. By direction of the board of managers, I made an effort, the past year, to have the United States commissioner of agriculture join this board, in a general work of the kind indicated. Thus far, however, I have not been successful.

Some four or five years since, this board in annual session, by resolution instructed the then secretary to enter upon and perform such work. It was not done, and I have not felt authorized to perform such duty without special instruction.

I have held several consultations with Prof. Bessey, dean of the agricultural and industrial college of this state, and one of the ablest botanists in the land, relative to some important work we might and ought to engage in, and which can be done at very little cost. The plan thought of is something like this: The board to appoint a state botanist, whose duty should be to investigate and report for our annual published volume, specially, on the grasses grown in Nebraska, both native and tame varieties introduced. The grazing industry and kindred interests of this state are of vital importance, and rapidly growing. This work could be performed and results obtained at a cost of very little, if any, exceeding mere stationery and postage.

The 50,000 edition of a forty page pamphlet I prepared, printed, and circulated at New Orleans last winter, was reprinted by the Hon. James Scott, state commissioner for public lands and buildings. By his kindness I have been furnished with a supply. Also I obtained from Hon. George B. Lane, copies of the census report in pamphlet form. These publications I have been mailing to applicants, in addition to letter correspondence indicated.

I have arranged, had printed and sent out to the secretaries of county and district organizations, and to county clerks in counties where no organization exists, a new and more complete form of blanks, for reports to the state board, as required by law. It is hoped we shall be able to obtain more detailed statistics hereafter. To this end, still in addition, I suggest that to secure prompt and full returns through this medium, the board offer a premium to the individual who shall present the best and most complete statistical county return or report, that individual to be either the secretary of an organization, county clerk, or any other person.

The legislature should be petitioned and importuned to provide, by form of law, that more complete statistical returns be secured, through the medium of assessors in their annual work. And further, that the collection of reports and other valuable information and data gathered by this board during the year could go before the public to more advantage, the restriction placed by the present law on our annual

* State officials, generally, to whom application is made for this class of information, refer correspondents to this office.

publication should be removed. No other states in the union prescribe and limit the State Board of Agriculture to a given number of pages to be published.

FAIR CIRCUIT.

At the semi-annual meeting of this board, held during the late state fair in September last, President Dinsmore and myself were appointed a special committee to confer with state fair managers in the northwest, with power to act, in matter of arranging if possible for a circuit of state fairs, whereby all concerned could be better accommodated, especially in matter of railroad transportation. I at once entered into correspondence with the secretaries of all state boards in the west. The result was, that as we had inaugurated the policy, I was designated to call a meeting of those interested, to be held in Chicago, sometime during the Fat Stock show. Accordingly I issued the following call:

STATE BOARD OF AGRICULTURE, SECRETARY'S }
OFFICE, BROWNVILLE, NEBRASKA, }
October 26, 1885. }

Presidents State Boards of Agriculture:

The plan of forming a circuit of state fairs, to embrace all or a portion of the western states, has been recently submitted to the officers of a number of state boards of agriculture, and the proposition has been received with much favor.

The representatives of the state boards consulted, without exception, favor the holding of such a meeting at Chicago, during the forthcoming American Fat Stock and Dairy show, November 10-19, 1885, to discuss the matter of forming a western circuit of fairs and other matters of common interest.

You are respectfully requested to appoint at least three members of your board delegates to the meeting, and forward their names to Charles F. Mills, secretary Illinois State Board of Agriculture, at Springfield, Ill., who has been requested to make the needed arrangements for the meeting.

Tuesday, November 17, 1885, at 7:30 P.M., has been suggested as the time most likely to suit the majority of the delegates. The club room of the Sherman house can be had for the meeting without expense.

The time and place of the meeting will be announced as above, and in case any change is made, the delegates will be notified. The meetings of the various national live stock and dairy associations at Chicago, at the time of the American Fat Stock and Dairy show, and the low excursion rates, will insure the attendance of a large number of members of the state boards of agriculture, from the middle and eastern states, who will be cordially welcomed to the meeting. It is believed that the meeting cannot fail to be productive of good results, and will enable all in attendance to form many desirable acquaintances. Yours truly,

ROBERT W. FURNAS,
Secretary Nebraska State Board of Agriculture.

To more effectually accomplish the object in view, I went to Chicago some days before the meeting of the fat stock show, and remained until its labors were completed. President Dinsmore joined me at the opening of the show. We thus had ample opportunity for conference and understanding as to general state matters.

The plan met with universal approval, and resulted in the organization of the "Western Fair Circuit Association," composed of the states of Minnesota, Wisconsin, Iowa, Nebraska, Kansas, Illinois and Missouri; Robert W. Furnas, Nebraska president, and Charles F. Mills, Illinois, secretary.

To secure uniformity of work and plans, the following standing committees were appointed:

Fees and Privileges—Festus J. Wade, Missouri.

Advertising—H. C. Wheeler, Iowa.

Classification—Charles F. Mills, Illinois.

Tickets—R. C. Judson, Minnesota.

Transportation—George Y. Johnson, Kansas.

Fairs for 1886, opening days, were arranged as follows:

Minnesota—August 30.

Iowa—September 6.

Nebraska—September 13.

Kansas and Wisconsin—September 21.

Illinois—September 27.

St. Louis—October 4.

In each case, the Fridays and Saturdays preceding dates announced as opening days are to be considered as preparation days.

PREMIUM LIST, RULES AND REGULATIONS, AWARDS, ETC.

Our premium list, by-laws, rules and regulations need revision badly.

The premiums, as a rule, should be reasonably increased, especially in important classes, live stock and dairy interests particularly.

On comparison, however, I find our premium list, even as heretofore offered, is at least an average with other first-class state fairs.

There should be added a class entirely devoted to education. Also, provide an industrial lot in fine arts and textile fabrics, for children under fifteen years of age, and a separate and distinct class for woman's work.

In this connection, permit attention to be called to the usual mode of rendering awards. The plan prevailing in the management of our fairs, in fact fairs generally, of picking up committees at random, from those who may happen to be present at the fair, with instructions, often, to rush matters through as rapidly as possible, without regard to system or programme, is not only farcical and faulty in the extreme, but contemptible in the estimation of those who value their exhibits. New plans are coming into vogue, worthy of adoption by all well conducted fair associations. These are: That experts be selected and employed to judge, particularly all live stock awards, to be made on well established scales of excellence, in regard to which there can be but little difference of opinion. The plan was practiced at New Orleans last winter and at other expositions, as well as at the late Fat Stock show at Chicago, with best results. One is to have but a single expert judge; the other, two judges, with an umpire. Where more than one, under no consideration are they allowed to counsel or compare notes before decisions are reached, and the decision when given, by each by secret ballot. Most men who engage in fine stock breeding are judges, and know what good stock is. To have, as is often the case, a fine thoroughbred worthy animal given an inferior or no premium, and a scrub with no points whatever pressed to the front with a first premium, simply because it has a sleek coat and has been well handled and fed, is fast driving our best breeders and best stock from the arena. The International Fair Association has adopted the two, with an umpire plan.

Nearly all the classes of our premium list, as they now exist, need remodeling and systematically classifying, as at present, the same individuals are often called on to pass judgment upon exhibits, as different in character and merits as possible to be, almost. It would be a rare and strange combination of accomplishments, in any one individual, that would enable to judge justly and satisfactorily on Per-

cheron and saddle horses, Spanish jacks and Shetland ponies ; or short horn and Jersey cattle ; or samples of wheat, mangold beets, rye bread, creamery butter and catawba wine ; or morticing machine, saddler's work, artificial teeth, horse collars, drain tile, and portable fence ; or oil paintings, shaving mug, wax work, leather work, and so on, almost *ad infinitum*, as we and many other fair associations now have classified and arranged.

This mixture of work, and next to unavoidable consequent rush and want of care on the part of superintendents and committees, results in confusion worse than confounded, and often great injustice to exhibitors in final adjustments of awards. For instance, the entry books, premium tags and ribbons, reports of committees, and pay roll book should tally exactly. Very often we find they do not. There are even many instances where only premium tags are placed on exhibits, with no entry book, or report of committee. Thus when the secretary comes to make up his pay roll book, and to issue warrants in payment of premiums, he is all at sea. He can only be guided by the entry book and returned reports of committees.

These matters are not referred to in a censorious spirit by any means, but simply to point out existing defects requiring reformation, and in justice to the work and duties of a secretary.

THE WORK OF THE SECRETARY'S OFFICE.

Not in spirit of complaint, but with pride in the enlargement of the work of the state board and its consequent increased usefulness, I state a fact, that the work and duties of the secretary have very greatly increased, especially the past year. It has not been within the power of any one individual to perform even the clerical work. From my salary of \$1,000 per annum, I have paid out for necessary help, to conduct its affairs, \$750, leaving me but \$250 for my services. I have given the office, the past year, since my return from New Orleans, undivided time and attention. While in New Orleans, a large proportion of my time was devoted to working upon the fair of 1885, as well as much of general work connected with the duties of the office. True, the work of 1885 was, in some respects, greater than usual. Under the circumstances—new location of the fair, new improvements, etc.—the fair and its success, in the minds of some, was regarded as somewhat problematical. I was determined, so far as I was concerned, it should be what it was, the most complete in all respects of our whole series.

While at New Orleans, exercising my own judgment and discretion, with a view to advance the state fair of 1885, I had printed, paid for, and circulated at my individual expense, thirty thousand advertising cards, copies of which are hereby presented and attached. These were distributed from our state exhibit advertising tables for months, and sent through the mails by thousands, to all parts of the country. I had made at New Orleans, brought home, and presented to the state board free of cost, a full set of large size photographs showing the entire state exhibit, the negatives of which cost \$100. That they might the better be put in condition for perpetual preservation, I had them handsomely framed. This expenditure I paid for from individual means. The total sum paid for printing cards, postage in circulating same, and framing photographs, was, as will be seen by itemized bills rendered, \$209. This bill was ordered paid by the board of managers.

I further state, in connection with the New Orleans work, that on my return, at my suggestion and by consent of Gov. Dawes, I turned over to the state board,

property of permanent use and value, show cases, glass jars and cases for showing grain and seeds, tables, desks, railings, piping, benches, stoves, baskets, wool exhibit and case, costing over fifteen hundred dollars.

Often, as the work of this office progressed during the year, I feared, under circumstances hereinbefore narrated, expenses might prove greater than heretofore. The final summary, however, shows them to be less than for years preceding, while the exhibits, attendance, receipts and balance on hand were larger than ever before. Respectfully submitted.

ROBT. W. FURNAS,
Secretary.

Treasurer Hartman presented his Annual Financial Report, which was also referred to the same committee as those of President and Secretary. (This report belonging to the work of 1885 is published with the proceedings of that year. See page 26-30.)

Competitive Arbor Day entries for 1885 were referred to Grennell, Holt and Putt. The committee in due time reported :

A. C. McLean, Olax, Custer county, greatest number of hard wood trees planted on Arbor Day, 1885, \$25.

William Robinson, Furnas county, greatest number of trees, all kinds, planted on Arbor Day, \$50.

John Lappan, O'Neil, Holt county, greatest number of cuttings planted on Arbor Day, \$50.

Mr Dinsmore, delegate to the National Cattlemen's Convention, made the following report, which was ordered be made a part of recorded proceedings:

To the Nebraska State Board of Agriculture:

As your representative, I attended the National Cattlemen's Convention, held in Chicago, Ills., on November 17 and 18, 1885. I found an earnest body of men, representatives of the great cattle industry, from nearly all of the states and territories, where the rearing and marketing of beef and cattle is made an important factor in the pursuits of the agricultural classes.

The time of the convention was largely taken up in listening to the reading of papers treating upon the various phases of the cattle industry, including their diseases, and the efforts made for the eradication and suppression of the same, through legal enactment.

These papers called forth argument, which threw much light upon the various subjects covered by the debate. While much has already been done through national and local legislation, in the way of systematic suppression of disease, not only among cattle, but all domestic animals, there yet remains much to be done, and it was the conviction of the convention that the average legislator, either national or state, was not yet imbued with the idea that the farmers wanted any legislation, touching this most important question.

It was suggested that agricultural societies pass resolutions demanding that members of congress lend their aid in support of measures for the suppression of contagious and communicable diseases among domestic animals. That an appropriation be asked for, so liberal that the stamping out of contagious diseases may be but a matter of a few months or years; when pleuro-pneumonia shall be no longer heard of in this land of ours.

From the reports showing the progress made, as well as the waking up of all classes to the the necessity of action, I am convinced that much good has and will be done through the National Cattlemen's Convention.

J. B. DINSMORE.

Adjourned to meet to-morrow morning at 9 o'clock.

SECOND DAY.

MORNING SESSION.

LINCOLN, January 20th, 1886.

Board convened pursuant to adjournment. Quorum present. Officers and members as yesterday.

Letters from Dinniny and Codman, explaining their absence, read, and on motion, they were excused.

The following communication from Prof. Bessey, Dean of the Agricultural and Industrial College of the University, was read, and on motion 2 o'clock this afternoon was designated as the hour to meet the committee contemplated in the communication.

LINCOLN, Jan. 19, 1886.

Gentlemen of the State Board of Agriculture:

At a meeting of the Board of Regents of the University, a committee was appointed to consider the advisability of establishing a School of Veterinary Science, and to confer with your body in regard to the matter. Will you be kind enough to fix a time when we may come before you in order to briefly discuss this matter.

CHAS. E. BESSEY,

For the Committee.

The following communication from the Omaha Fair and Exposition Association was read, and on motion, Messrs. Dinsmore and Furnas were appointed delegates to the meeting.

OMAHA, NEB., Jan. 14, 1886.

R. W. Furnas, Esq., Lincoln, Neb.:

Dear Sir—I am directed by the management of the Omaha Fair and Exposition Association, to invite your association to send a delegate to meet this and other associations at the Paxton Hotel, in Omaha, Neb., on Tuesday, Jan. 26,

1886, to consider the propriety of organizing a circuit of Fall Fairs, that will accommodate the Associations and exhibitors who may desire to attend.

Your delegate to be the guest of this association during said meeting. Your early attention and reply desired.

Yours Truly,

DANIEL H. WHEELER,

Secretary O. F. & Ex. Association.

P. S. This Association made arrangements with the secretary of the Iowa State Fair, on the 26th of last June, to hold its fair the week following the Iowa Fair.

Truly,

D. H. W.,

Secretary.

Communications from Thos. Vail, secretary National Trotting Association, H. V. Bemis, editor *Chicago Horseman*, and others, relating to the meeting of the Biennial Congress of said association, at Chicago, Feb 10th, 1886, were read. W. H. Barstow, of Crete, was appointed delegate to said congress, his actual expenses to be paid by this Board.

Dr. J. Gerth, Nebraska State Veterinary Surgeon, having been invited by President Dinsmore to prepare a paper on the swine plague, now read an important and interesting paper on this subject, which was listened to with great attention. On motion, thanks, with a rising vote, were tendered the Doctor, and a copy of his paper solicited for publication in the annual volume of this Board. The address will be found in its place in the appendix.

Prof. Chas. E. Bessey, Dean of the Agricultural College, had also been invited by President Dinsmore to prepare and read a paper at this meeting, on the grasses of the state. As the Professor had talked much on this subject at this meeting, he suggested that the paper he had prepared, and which he had present, be printed without formal reading. This was agreed to and thanks were extended for the Professor's valuable services. This paper will be found in its place in the appendix.

The committee to which was referred the Annual Address of the President and Secretary, submitted the following report, which was adopted:

To the President and Members of the State Board of Agriculture :

Your committee, to whom was referred the Address of the President, would most respectfully recommend that so much of said Address as refers to improvements in and about the State Fair Grounds, be referred to the Board of Managers.

And that part referring to the judging of stock by an expert, also be referred to the Board of Managers.

That part of said Address referring to the Secretary's office, be referred to the full Board, with recommendation that \$500 be added to the present sum, as an allowance for such services.

With regard to International Association of Fairs, your committee would recommend that this association become a member of the National Association. Also that this Association become a member of the National Cattle Growers' Association.

In matter of the report of the Secretary, we would most respectfully report that so much of said report as refers to premiums, be referred to the Board of Managers. To the recommendation of the Secretary, relating to a Class devoted to Education, also a Lot in Fine Arts for children of 15 years and under, be referred to the Board of Managers, together with the part relating to the judging of stock by an expert.

And that in reference to the duties and work of the Secretary's office, be referred as in the report of President's Address.

Respectfully submitted,

DANIEL H. WHEELER.

E. N. GRENNELL.

H. B. NICHODEMUS.

H. D. KELLY,

LINCOLN, NEB., January 20th. 1886.

To the Nebraska State Board of Agriculture :

Two members of your committee to which was referred the reports of the Secretary and Treasurer, would report that we have checked up all the reports, and find so far as we have information that the list of orders issued is correct.

We find that the total money reported to have been on hand and received by the Treasurer for 1885 was.....	\$32402.68
Orders 1884, paid.....	\$ 57.50
Orders 1885, paid.....	22306.80
	<hr/> 22464.30
Leaving balance.....	\$9938.50
Orders of 1885, unpaid,.....	\$13.50

Respectfully,

DANIEL H. WHEELER.

W. E. HILL.

D. H. Wheeler, on the part of himself, as member and chairman of the committee to which was referred the Financial Reports of the Secretary and Treasurer, made the following report.

LINCOLN, NEB. January 20th, 1886.

To the Nebraska State Board of Agriculture :

The majority of the committee to which was referred the financial reports of the Secretary and Treasurer, directing the chairman to return those reports without a report, the undersigned, as its chairman, not believing in the divine right of kings,

and that kings can err as other poor mortals, respectfully submit the following report and recapitulation of the disbursements, as near as the same can be determined, with no bills, accounts, or other data than the list of orders issued and paid by the Treasurer, report that the expenditure for the year 1885 was for the following purposes, and to the parties here named :

Regular premiums.....	\$5426.15
Badges for premiums.....	150.00
Speed premiums.....	3828.30

Total premiums.....\$9404.35

Fair expenses.....	\$1468.64
Incidental expenses.....	436.25
Printing & Advertising.....	2248.85
Postage & Stationery.....	284.00
Labor	320.05
Lumber.....	146.83
Machinery Hall, Power and Labor.....	238.50
B. & M. Switching Cars.....	66.00
Chariot Races.....	400.00
Bicycle Races.....	200.00
Police.....	802.00
Band.....	175.00
Clearing Grounds.....	187.55
Class Supts.....	222.10
Ass't. Supt. and labor under his direction.....	597.40
Gate Keepers.....	280.75
Ass't. Treasurers.....	219.25
Ass't. Secretaries.....	374.25
Address and Expenses of Orator.....	130.00
W. R. Bowen, Gen'l Supt.....	125.00
C. Hartman, Salary as Treasurer.....	250.00
J. C. Bonnell, services and material.....	163.45
O. M. Druse.....	100.00
J. Jensen.....	128.75
W. H. Barstow.....	143.75
J. B. Dinsmore.....	150.00
E. N. Grennell.....	166.85
L. A. Kent.....	168.90
Ed. McIntyre.....	224.75
S. M. Barker.....	366.25
R. W. Furnas Salary.....	1000.00
Hotel Bills.....	927.88

\$22,306.80

Respectfully submitted,

D. H. WHEELER,

Chairman Committee.

Your Committee to which was referred the reports of the Secretary and Treasurer relating to finance, would respectfully report we found the same correct.

Respectfully,
D. H. WHEELER,
Chairman.

JANUARY 21st, 1886.

Mr. McIntyre offered as an amendment to the present By-Laws of the Board, that the salary of the Secretary be changed from one thousand to two thousand dollars, to commence with the year 1886. Mr. Wheeler moved to amend, making the salary sixteen hundred dollars. Amendment lost and the original amendment of McIntyre adopted.

Mr. Bowlby moved that the compensation of the Board of Managers be fixed at \$5 per day while engaged in the performance of official duties.

Mr. Wheeler moved to amend; That the sum of \$1000, or so much thereof as may be necessary, be set apart to compensate the whole Board for services. The amendment was adopted, and the action by vote ordered to be incorporated as a Section in the By-Laws. It was also ordered by vote, that the salary of the President of the State Board be fixed at \$200, and this provision also be incorporated as an amendment to the By-Laws.

On motion, a committee of five were appointed by the President to receive nominations, and report members to fill the expired terms. On motion McIntyre, it was ordered that the chairman of said committee be the President of some one of the County Societies.

W. D. Wildman, J. Jensen, R. H. Henry, O. M. Druse, and E. A. Barnes were appointed the committee.

The following nominations were then made and referred to the committee.

G. W. Hervey, Knox County; Chris. Hartman, Douglas County; J. D. Macfarland, Lancaster County; F. H. Wilson, Cass County; J. B. McDowell, Jefferson County; J. E. Lee, Furnas County; W. R. Harris, Johnson County; H. B. Nicodemus, Dodge County; W. D. Kelley, Madison County; S. H. Webster, Valley County; C. R. Glover, Brown County; S. Barnard, Pawnee County; Ed. McIntyre, Seward County; E. H. Marshall, Franklin County; W. Pickrell,

Gage County; H. Fry, York County; Ed. King, Custer County; — Green, Butler County; D. V. Stevenson, Richardson County; W. E. Hill, Otoe County; W. H. Barstow, Saline County; S. M. Barker, Merrick County; J. C. Warner, Webster County; F. C. Simmons, Richardson County; D. Richardson, Merrick County; F. A. Salsberry, Gosper County; J. R. Van Buskirk, Hamilton County; J. M. Cook, Nuckolls County; J. M. Burns, Brown County; C. B. Coffin, Valley County; W. R. McKee, Otoe County; L. A. Kent, Kearney County; W. R. Bowen, Douglas County.

Board adjourned until 3 o'clock this afternoon.

SECOND DAY.

AFTERNOON SESSION.

LINCOLN, Jan. 20th, 1886.

Board convened pursuant to adjournment. Quorum present. Officers and members as in forenoon.

In compliance with provisions made this forenoon, a committee from the State University appeared before the Board. Prof. Bessey, as chairman, presented the following, relating to the establishment of a Veterinary School, in connection with the Agricultural Department of the University.

THE UNIVERSITY OF NEBRASKA, LINCOLN.

THE INDUSTRIAL COLLEGE. }

OFFICE OF DEAN, January 19, 1886. }

Gentlemen of the State Board of Agriculture:

The question as to the advisability of establishing a Veterinary School in the Industrial College of the University has been under discussion by the University authorities. The matter was brought up at the meeting of the Board of Regents, in December, when, upon recommendation of the committee to whom it had been referred, a joint committee of the regents and faculty was appointed to investigate the question fully, and to confer with your body respecting it. The committee, so appointed, consists of Messrs Gere and Burnham, on the part of the regents, and the Chancellor and Professor Bessey, on the part of the faculty.

The question which we wish to lay before you may be stated as follows, viz:

The University has been urged repeatedly to establish a Veterinary School, for instruction in the structure, disease and treatment of domestic animals. The arguments presented have been that this is a state in which nearly all of agriculture is devoted to the growing of stock; that there is more capital to-day invested in stock than in any other product of the farm; that the increasing prevalence of dis-

eases in our herds demands a knowledge of animal maladies and their treatment on the part of the stock grower, and, finally, that in connection with such a school experiments of great value could be undertaken upon the Experimental Farm.

We wish to know whether, in your opinion, the establishment of such a school would meet with the full approval of the agricultural part of the population of the state. We want to avoid making a mistake in this matter. We cannot afford to incur the labor and expense necessary to the establishment of a first class veterinary school, to find out, when too late, that it is not demanded, and that its patronage is too small to warrant its continuance. Unless we can have a good class of young men to work upon, the school will have a feeble vitality, and it will be far better for us not to undertake the additional labor.

Then, again, there is the question of money. As you are doubtless aware, the University, although well endowed, can not use any of its funds unless they have been specifically appropriated by the legislature. This veterinary school must, then, approve itself to the successive legislatures, in order that it may receive from them the appropriations so necessary to its growth and continuance. The school, in order to be worthy of this great state, must have *the best* facilities which money can command. It will thus need instructors, buildings, apparatus, and experiments, all of which require money. May we reasonably expect such an approval, by the people of the state, as will render adequate support of the school certain?

Gentlemen of the Board of Agriculture, we do not come simply seeking formal approval; we ask for your candid advice and aid in our effort to reach a wise conclusion, and a safe answer to the question submitted to us, "Shall the University establish a Veterinary School?"

Respectfully submitted,

CHARLES E. BESSEY,

For the Committee.

On motion the plan of Veterinary School as contemplated, was adopted by a rising vote, forty-six counties in the state voting for, and one against.

Prof. Bessey announced, that with such an endorsement from the representatives of the agricultural interests of the state, the Regents of the University would at once proceed in the establishment of a Veterinary School.

The committee on nominations to fill vacancies reported as follows, and the report unanimously adopted:

Mr. President:

Your committee having under consideration the nomination of members to fill vacancies on the State Board of Agriculture, would respectfully submit the following named gentlemen for election by your Board to fill vacancies.

W. D. WILDMAN,

J. JENKINS,

R. H. HENRY,

O. M. DRUSE,

ELL. A. BARNES,

Committee.

L. A. Kent, Minden, Kearney county; H. B. Nicodemus, Fremont, Dodge county; Ed. McIntyre, Seward, Seward county; J. B. McDowell, Fairbury, Jefferson county; S. M. Barker, Silver Creek, Merrick county; D. V. Stevenson, Falls City, Richardson county; H. D. Kelly, Madison, Madison county; Chris. Hartman, Omaha, Douglas county; R. R. Greer, Kearney, Buffalo county; W. E. Hill, Nebraska City, Otoe county; J. D. Macfarland, Lincoln, Lancaster county; J. M. Lee, Oxford, Furnas county; S. H. Webster, Ord, Valley county; Geo. A. Brooks, Bazile Mills, Knox county; E. King, Broken Bow, Custer county.

On motion the Board proceeded to the election of officers for the current year. President appointed as tellers, McDowell, L. H. Kent, and Young.

There being no other nominations for President than S. M. Barker the secretary was authorized to cast the ballot for him, and he was declared elected. Seventy-six votes cast. Gaylord and Putt were appointed a committee to escort the President elect to the chair.

J. M. Burks, R. H. Henry, E. N. Grennell, J. B. McDowell, R. Daniels, and E. A. Barnes were nominated for 1st Vice-President.

The vote resulted: Burks, 10; Henry, 35; Grennell, 6; McDowell, 6; Barnes 4; Daniels, 0;

Mr. Henry, having received a majority of the votes cast, was declared elected.

J. M. Burks and F. H. Holt were nominated for 2d Vice-President. The vote resulted: Burks, 21; Holt, 41.

Mr. Holt, having received a majority of the votes cast, was declared elected.

Chris. Hartman and L. A. Kent were nominated for Treasurer. Resulted as follows: Hartman, 27; Kent, 38.

Mr. Kent, having received a majority of the votes cast, was declared elected.

On motion Mr. Dinsmore, Mr. Wheeler was requested, and authorized to cast the unanimous vote of the board for Robt. W. Furnas for Secretary, which was done, and Mr. Furnas declared elected.

On motion the incoming Board of Managers was authorized to appoint a General and Ass't Supt., all class supts., supt. gates, tickets, and such others as they may deem essential to conduct the fair.

Chancellor Manatt, of the State University, addressed the following communication to the Board. The invitation was accepted, and ordered to be spread upon the minutes.

Hon. Robt. W. Furnas, Sec'y, etc.:

MY DEAR SIR—I wish through you, to extend to the State Board of Agriculture, a cordial invitation to visit the University. We meet at 10:25 each morning in chapel, and that would be the most pleasant hour for such visit, but we shall be glad to see the Board, as a body, or individual members, in our museum, laboratories, or lecture rooms, either at this time or whenever they may happen in the city.

Very truly yours,

I. J. MANATT.

Mr. McIntyre offered the following preamble and resolution, which was unanimously adopted:

WHEREAS, It appears that preventative inoculation for swine plague has been a practical success, and has every prospect promising beneficial results to the stock interests of the state; therefore be it

Resolved, That the Live Stock Sanitary Commission, with the approval of the Governor, be requested to take such steps as will hasten the preparation of swine virus for the benefit of the swine breeders and stock growers of this state, regardless of time and expense.

The account of D. H. Wheeler & Co. for rent library room for the year 1885, \$60, was presented, allowed and ordered paid.

Mr. Brunstetter, President of the Gosper County Agricultural Society, stated that the county society he represented had held two fairs. That he had made application to the county clerk for aid contemplated by law, and had been refused. He asked the advice and counsel of the Board. One or two other counties presented the same complaint. The complainants were advised to file the facts of these complaints with the Secretary of this Board, in writing, and the Secretary instructed, with the papers thus filed, to submit them to the Attorney General of the State, asking from him a decision in the matter.

Mr. Hartman presented the claim of Meyer & Co., Omaha, for use of band escorting Gen. B. F. Butler to the fair grounds in 1884, \$50. The Secretary stated this bill had been considered before by the Board of Managers and rejected, as this Board had nothing to do with employing a band for that purpose. After several motions and amendments, with discussions following, the whole matter was laid on the table.

On motion Mr. Dinsmore, the following preamble and resolution was adopted:

WHEREAS, Exhibits of rare merit at our State Fair have, at various times, been passed by the awarding committee, without the necessary written recommendation, whereby the Board of Managers are authorized to make special awards of premiums. By this failure to perform this, their plain duty, on the part of our awarding committees, great injustice has been done to certain exhibitors; therefore be it

Resolved, That the Board of Managers be, and are hereby directed to award to T. W. Harvey, as a premium on his magnificent Polled Angus bull, a certificate or diploma of merit.

On motion Mr. Wheeler, the actual hotel bills of all members in attendance at this meeting were ordered paid, and the Secretary instructed to draw warrant on the Treasurer for the same.

Ordered by vote that the Secretary draw a warrant on the Treasurer in favor of the State Horticultural Society for the money paid as premiums by that Society for the years 1884 and 1885. And that before this board agree to pay any further premiums, the Committee on Premium Lists, for each the State Board and State Horticultural Society, shall have a conference in relation to the premiums of the Horticultural Society, and the manner of their payment, and that the action of said conference committee be submitted to the Board of Managers for their approval or disapproval.

On motion Mr. McIntyre, the sum of \$500, or so much thereof as may be found necessary, be appropriated to erect a special building for the use of the State Fish Commission in making a fish exhibit at the State Fair.

President Barker appointed the following Board of Managers for the current year. The appointment was confirmed by vote of the Board: Ed. McIntyre, Chairman, Seward; J. B. Dinsmore, Sutton; M. Dunham, Omaha; H. B. Nicodemus, Fremont; E. N. Grennell, Ft. Calhoun.

It was ordered that \$550, or so much thereof as may be necessary, be appropriated for the purpose of erecting a special building for the accommodation of the State Dairyman's Association in making a state exhibit of dairy products at the coming State Fair, and that the whole matter be referred to the Board of Managers, with power to act.

On motion, members desiring to return home be given leave of absence.

The following communication from the American Percheron Horse Breeders' Association was received, and the whole subject matter referred to the Committee on Premium Lists:

To the Honorable Members of the State Board of Agriculture of Nebraska:

GENTLEMEN—We, the breeders and importers of Percheron horses in the United States, incorporated under the name "American Percheron Horse Breeders' Association," respectfully petition your honorable body, the State Board of Agriculture of Nebraska, to extend to the Percheron breeders the same encouragement and privileges that you accord to other recognized breeds of cattle and horses, by making a separate class for Percherons in your forthcoming premium list.

To show that the breeding of Percheron horses in your state has assumed proportions of sufficient magnitude to warrant you in extending this encouragement, we have only to state that there are a larger number of imported and pure-bred Percheron mares, whose purity of blood and pedigrees are attested by their records in the Percheron Stud Books of France and America, than that of any other pure race of horses in your state. Nearly 100 pure-bred Percheron mares, and a large number of pure-bred Percheron stallions, have been introduced into your state during the past year.

We would suggest a classification similar to the enclosed, which is the one that is being adopted by most of the agricultural associations for the coming year.

To assure you that the American Percheron Horse Breeders' Association are anxious to encourage the breeders in your state, we place at your disposal a beautiful gold medal, two and a half inches in diameter, to be awarded by you, under the usual rules of competition, to the best pure blood Percheron stallion bred in the state of Nebraska.

To prove that the Percheron horse-breeders are entitled to the recognition they are asking of the different states, it is only necessary to state that they represent an ownership of pure-bred mares and stallions, recorded in the Percheron Stud Books of France and America, that will compare favorably in numbers with any other draft horse race in this country. The entries in the seven volumes of the Percheron Stud Books aggregate in numbers about 11,000. The Percheron race is recognized by the highest authorities as being one of the finest draft horse races in Europe. The French government, recognizing its superior value, authorized the compilation of the history of the race by one of its most noted historians, and the government themselves recognize it as the finest race in France, by giving it a prominence in all their catalogues, and by encouraging Percheron breeders in various ways, especially by the giving of prizes by the Minister of Agriculture, at the exhibitions of the Societe Hippique Percheronne, at which exhibitions none but registered Percherons are admitted to competition; and further, the interest which they take in the matter, by delegating the Inspector General of the government studs of France to preside at the awards of these exhibitions; and lastly, by the earnest appeal of Chas. Du Hays, the controller of all the government Stud Books in France, to the American breeders to preserve in its purity the fine Percheron race, and to exclude from registration all animals not recorded in the Percheron Stud Book of France. An extract from a communication received from him by our Society on the 10th of last November reads as follows:

"Your Society will feel honored by the presence of the head of your department of agriculture at your bi-annual meeting in November next. I have no doubt that under his patronage you will take decided resolutions to persist and continue in the true path which you have taken, and out of which you must never move.

"May the friendly relations which have been formed between the Perche and your Society continue and grow stronger and stronger every day. It is absolutely necessary that the two societies should work together in order to preserve the fine Percheron breed in its purity, and to protect it from any alliances with the scrofulous breeds of the north of France. I am aware that your Society is working with that aim, and I wish most heartily you should persist and continue to do so. You must not admit any other animals to registration but that of the stock already registered in the Percheron Stud Book of France, and once admitted into your Stud Book follow the methods already used for thoroughbreds in England and France."

Ever since the history of the Percheron race was given to the American people in full, concentrated effort has been rapidly going forward for its establishment in this country on the sound basis of scientific and intelligent breeding principles, which can only be based upon established stud records, for the preservation of genealogy, in order to secure to both breeder and purchaser a certainty of purity of blood.

For the encouragement of the breeders of Percheron horses the Association has perfected a plan for holding annual society exhibitions. It is proposed to hold these exhibitions under the auspices of the different State Fair Associations of the Mississippi Valley, to be held in no state twice until the entire circuit is made. The sum of \$5,000 has been appropriated to be awarded in prizes at the first of these exhibitions, to take place next fall in whichever state offers the greatest inducements. You will therefore see that the rights of the breeders of Nebraska are being recognized by our Association, and that your state will in the routine receive the benefits of this exhibition.

Believing that an industry which promises to be of so much benefit to your people cannot fail to receive the attention and prompt action of your honorable body, we are

Very respectfully,

HON. T. W. PALMER, President.

RUFUS B. KELLOGG, Vice-President.

S. D. THOMPSON, Secretary.

J. F. STUDEBAKER, Treasurer.

DIRECTORS.

Hon. M. E. Post,
Col. W. C. Lemert,
Dr. Ezra Stetson,

Capt. T. Slattery,
Geo. W. Stubblefield,
Hon. Geo. E. Case,

M. W. Dunham,
J. H. Bowman,
T. B. Snider.

MEMBERS.

E. G. Vaile,
Neb. State B'rd of Agriculture,
C. F. Gill,
G. N. Lyman,
Oliver Harwood,

Cary Culver,
Dr. W. M. Ormund,
N. W. Morley,
S. W. Emery,
Jno. Vance,

J. W. Stimson,
C. D. Holt,
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W. W. Hoy,
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 Mr. Savage,
 J. M. Fletcher,
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 C. Remington,
 F. B. Redfield,
 J. E. Wilson,
 J. Wilson & Son,
 R. L. Wells,
 J. R. Lenhart,
 L. G. Foster,
 Frank Earnard,
 J. N. Anderson,
 Henry Avery,
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 W. H. McMillan,
 J. D. Grimes,
 Jas. Jones,
 J. A. Witter,
 Geo. E. Case,
 Jas. D. Becket,
 Perry Chisholm,
 J. B. Diamond,
 H. Walker & Sons,
 E. J. Turner,
 C. K. Bailey,
 E. D. Mørse,
 C. R. Paxton,

Geo. Parsons,
 E. R. Bennett,
 B. F. Lake,
 A. F. McKee,
 H. C. Farnum,
 Jno. Pierce,
 A. D. Albro,
 R. W. Stubblefield,
 Ed. Hodson,
 T. B. Buffum,
 Jno. Delancey,
 H. E. Alvord,
 Wm. T. Price,
 F. A. Woodbridge,
 G. W. Phillips,
 H. C. Jewett,
 Ira Vanderveer,
 D. F. & W. J. Miller,
 Logan H. Root,
 W. R. Allen,
 G. W. Brown,
 N. Whitman,
 W. H. Winter,
 Danl. Dunham,
 Dillon Bros.,
 Hon. Benj. Eaton,
 E. A. Hitchcock,
 Boyd Skalton,
 S. Kendeigh,
 Jas. M. Dunn,
 Capt. Fred Pabst.

THIRD DAY.

FORENOON.

LINCOLN, Jan. 21st, 1886.

Board convened pursuant to adjournment. Quorum present. Officers present same as yesterday.

By vote of the Board Prof. Chas. Bessey was appointed by the Board State Botanist, with term of service during pleasure of him and the Board, and that an appropriation is hereby made to defray his stationery and postage expense in connection with his duties not to

exceed the sum of \$80 for the year 1886, unless further ordered by the Board of Managers.

The President, by order of the Board, appointed Dinsmore and Humphrey delegates to the National Fair Association, Indianapolis, February next, expenses to be paid by this Board.

By same order, John Jensen was appointed delegate to the American Agricultural Congress, New York city, in February next, his expenses to be paid by this board.

On motion of Mr. McIntyre, the sum of \$1,500, or so much thereof as may be required, be appropriated to enlarge the amphitheatre on grounds, the same to be expended under the direction of the President and Board of Managers. Mr. Hill offered the following resolution, which was adopted:

Resolved, That before the Board of Managers expend any money in the erection of buildings on the fair grounds they will first obtain from the Nebraska Exposition Association, owning the grounds, permission to erect said buildings, and to remove the same at the end of four years, or at any time the Board may see fit or desire to do so.

The Committee on Premium Lists appointed by President Dinsmore reported it had not completed its work. By vote of this Board the committee was continued in order to complete its work, which when completed it shall submit to the Board of Managers, who shall have full power to act in all matters pertaining thereto.

The matter of compensating the House hall janitor and engineer for care of hall during this session was referred to the Board of Managers with power to act.

The matter of paying expenses of delegates appointed to various national meetings was referred to the Board of Managers for their approval.

On motion the Board adjourned *sine die*.

SEMI-ANNUAL MEETING NEBRASKA STATE BOARD OF AGRICULTURE.

LINCOLN, NEB., Sept. 16th, 1886.

Regular semi-annual meeting State Board of Agriculture convened at office of the Board, Capital Hotel, at 8 o'clock.

President S. M. Barker presiding. Secretary, Robt. W. Furnas.

Members present: J. D. Macfarland, J. B. McDowell, S. H. Webster, H. D. Kelley, C. Hartman, J. Jensen, E. N. Grennell, R. R. Greer, E. A. Barnes, J. M. Burks, D. H. Wheeler, M. Dunham, C. W. Conklin, F. H. Holt. The following counties were represented by their Presidents: Hall, Hitchcock, Jefferson, Lancaster, Red Willow, and Valley.

Members of the Board not present were given until winter meeting to render excuse.

Dates of next annual fair, 1887, were fixed to follow those of Iowa as heretofore.

On motion of E. A. Barnes the President was instructed to appoint a committee of five to revise and correct the premium list and report at winter meeting in January next.

Harvey Pickrell's case was brought before the Board and decided that he was entitled to all the pay claimed by him in the novelty race of 1885, and the Secretary was directed to draw a warrant for him in the sum of seventy-five dollars.

J. E. Shepherd, Omaha, claimed that the Arbor Day premium, 1884, to H. H. Shedd was erroneously awarded. Referred to Board of Managers, with instructions to examine the papers and report of committee, and determine the matter as justice in the case would indicate.

Board adjourned.

Secretary.

OCT. 5TH. President Barker announced the following Committee on Premium List: J. B. Dinsmore, Mrs. S. C. Langworthy, Ed. McIntyre, M. Dunham, J. D. Macfarland.

ANNUAL MEETING NEBRASKA STATE BOARD OF AGRICULTURE.

FIRST DAY.

LINCOLN, NEB., January 18th, 1887.

In compliance with law in this case made and provided, the Nebraska State Board of Agriculture this day convened in the lecture room of the new laboratory building, University Place, Lincoln, Nebraska.

There were present the following

OFFICERS:

S. M. Barker, President; R. H. Henry, First Vice-President; I. A. Kent, Treasurer; Robt. W. Furnas, Secretary.

On roll call the following members of the State Board were found to be present:

L. A. Kent, J. D. Macfarland, Ed. McIntyre, J. B. McDowell, S. M. Barker, J. M. Lee, D. V. Stevenson, S. H. Webster, H. D. Kelley, E. King, Chris. Hartman, R. R. Greer, W. E. Hill, R. W. Furnas, O. M. Druse, E. N. Grennell, J. Jensen, E. A. Barnes, J. B. Dinsmore, J. M. Burks, D. H. Wheeler, M. Dunham, R. H. Henry.

Letters giving reasons for absence were read from H. B. Nicodemus, R. Daniels F. H. Holt, and C. W. Conkling, which were considered satisfactory, and they were excused. W. R. McCully had removed to California.

On roll call of counties the following were found to be represented, either by their respective Presidents or legally authorized delegates:

Antelope, Adams, Boone, Buffalo, Butler, Burt, Brown, Custer, Cass, Clay, Dixon, Dodge, Dawson, Furnas, Fillmore, Greeley, Gage, Howard, Harlan, Hitchcock, Hall, Hamilton, Jefferson, Johnson, Kearney, Knox, Logan, Lancaster, Merrick, Nemaha, Nance, Otoe, Polk, Platte, Pawnee, Richardson, Seward, Saline, Sarpy, Valley, Webster, Washington, York.

On motion, D. H. Wheeler, of Douglas; W. W. Philleo, of Adams; and J. M. Lee, of Furnas, were appointed a Committee on Credentials.

While the committee was out on duty, Dr. J. Gerth, State Veterinarian, read a paper, which on invitation he had prepared, on the subject of Glanders and Farcy. A vote of thanks was extended to Dr. Gerth, and a copy of his address solicited for publication. [This paper with others will be found in the Appendix hereto attached.]

The Committee on Credentials in due time reported the following list of Presidents and delegates present from county societies, as entitled to seats and one vote each. The report of the committee was adopted:

Adams—W. W. PHILLEO, Delegate.
Antelope—E. A. BUTLER, President.
Boone—LORAN CLARK, President.
Brown—C. R. GLOVER, President.
Buffalo—H. A. LEE, President.
Burt—A. P. JOB, Delegate.
Butler—D. B. AMAGOST, President.
Cass—FRED GORDEN, President.
Clay—G. F. WARREN, Delegate.
Custer—ED. KING, President.
Dawson—E. B. SMITH, President.
Dixon—S. J. HART, President.
Dodge—W. L. MAY, Delegate.
Douglas—HENRY EIKE, Delegate.
Fillmore—J. JENSEN, President.
*Frontier—A. E. POWERS, Delegate.
Furnas—J. CARMEAN, Delegate.
Gage—P. J. MYERS, President.
Greeley—P. H. BARRY, President.
Hall—ELI A. BARNES, President.
Hamilton—W. H. BARSTOW, Delegate.
Harlan—D. E. ALLEN, Delegate.
*Hayes—J. S. HUGHES, Delegate.
Hitchcock—W. D. WILDMAN, President.
*Holt—J. J. McCAFFERTY, President.
Howard—ADAM BRICKEL, President.

*Returns from these counties were not received at time of meeting, but as they were reported *on vote*, representation was given.

Jefferson—W. W. WATSON, Delegate.
 Johnson—THEO. SMITH, President.
 Kearney—L. A. KENT, President.
 Knox—GEO. E. CHENEY, Delegate.
 Lancaster—A. HUMPHREY, President.
 Madison—JOS. STEWART, Delegate.
 Merrick—S. L. WISE, President.
 Nance—W. H. PATON, Delegate.
 †Nemaha—JAS. G. MCCLAY, President.
 Otoe—JAS. W. EATON, Delegate.
 Pawnee—S. A. HARTWELL, President.
 Platte—J. E. NORTH, Delegate.
 Polk—G. W. GREGG, President.
 Richardson—W. H. VANDERVENTER, Delegate.
 Saline—W. H. SMITH, President.
 Seward—WM. GILL, President.
 Valley—A. D. ROBINSON, President.
 Washington—CHAS. SELLECK, Delegate.
 Webster—J. C. WARNER, President.
 York—HENRY FRY, Delegate.

The Committee on Credentials had reported two county organizations in Brown county, one at Long Pine and one at Ainsworth, without recommendation. After considerable discussion it was decided that this Board cannot, under the provisions of law, recognize more than one county organization in any one county, and that in this instance the Long Pine organization represented by Mr. Glover be recognized as the Brown county organization. This action was by a unanimous vote.

President Barker then delivered his annual address, which is as follows:

PRESIDENT'S ADDRESS.

Gentlemen of the State Board of Agriculture and People of Nebraska:

It is not only the custom, but a duty devolved upon me by the law of this organization, to address you at the annual meeting. I shall detain you but briefly.

I congratulate you, gentlemen, on the success of the late state fair, held in this city, in September last. Such success can only be obtained by hard work, on your part, and the most perfect harmony of your officers. No one man can make a fair.

† This county sent in its returns, but there was no representative present.

It requires the combined efforts of the Board, as well as the aid of the public. Every person who makes an exhibit, and every one who attends the fair, assists the enterprise. I am aware that the people are inclined to the belief that as they do not belong to the State Board, they have nothing particularly to do in the matter. But, gentlemen, this is a great mistake. Neither the Board of Managers, or officers combined, can accomplish the work alone. They may arrange and conduct the details, but in order to secure complete success we must have the co-operation and assistance of the people. I trust all will take this view of the matter, and continue their aid in making exhibits, and in all other ways lend their presence and influence. I see before me the Presidents of county societies; I desire, gentlemen, to impress on you the importance of your position. You are, by law, members of the Board, clothed with all the rights, privileges and duties of its members; you can do much in your respective localities; you are familiar with your people, coming in constant and intimate relations with them. By these associations, you can awaken and continue interest in the agricultural affairs of the state; encourage them in the matters of exhibits, attendance and patronage. The farmer, stockmen, the merchant, mechanic and laborer, are all equally and directly interested in the welfare of this organization and its work. To our fairs, particularly, they come to see and know more of our soil and its products, as well as the handiwork of the mechanic and artisan. In fact everything, both useful and ornamental, is to be found and seen at these annual fairs. We are not laboring for individual aggrandizement, but for the good of the great state of Nebraska. I hope we all feel the importance and responsibility of our respective places in the line of work.

To the railroads we are greatly indebted for our success, and we should not be slow in acknowledging our obligations to them, as well as to the press of the state. The railroads have transported all, to and from the fair free, and in addition given cheap rates to visitors,—they have responded to every call, freely and without hesitation. I venture to assert, no other state is so favorably considered and treated. Too much praise cannot be given the people of Lincoln for their untiring energy and assistance in rendering our fairs complete successes. There is no reason why we may not continue to advance and prosper, as an organization; no other state has better grounds, or more enterprising and determined people; no state better material of all kinds to exhibit. The well founded impression has gone abroad, throughout the whole country, that Nebraska, in her fairs, is behind no other state in the union. In travelling in other states, I have been proud to hear from others this kind of evidence and appreciation. Further, I am safe in the assertion, that no other fair in the United States shows a more handsome balance in the treasury than Nebraska has shown the last two years.

And now, gentlemen, in conclusion, accept my thanks for the uniform courtesy and kindness I have received at your hands, especially during my term as President of the Board. With sincere wishes for your future success and usefulness, I am, as ever, yours.

SAMUEL M. BARKER, President.

Secretary Furnas then read his annual report as follows:

SECRETARY'S ANNUAL REPORT.

To the President of the Nebraska State Board of Agriculture:

In compliance with the provisions of Article 8, By-Laws of the Board, I herewith submit my annual report as your Secretary. A complete list of warrants drawn by your order, and both the State Board and Board of Managers, with vouchers therefor, are presented for examination.

The annual report of the Secretary would be incomplete with the mere financial presentation.

If those of us connected with expositions, fairs and the like, fail to learn something new each year, and to profit thereby, we give evidence of unfitness for places we occupy. A prime factor in a state fair management should be to induce exhibition of industrial products of all kinds, from all parts of the state. Experience convinces me that this can be the better accomplished by enlarging both the number and value of the premiums offered for county and collective exhibits. Say one thousand dollars, divided into five premiums, 1st, 2d, 3d, 4th and 5th, and then allow the individual contributors to such collective exhibits to compete for minor premiums offered in other and respective classes. This will stimulate individual efforts and exhibits, which, of late, have become so meagre as to be almost extinct. It would be well to provide for neighborhood collective exhibits, on the same principle, but of course on smaller scale.

Great dissatisfaction and confusion of late has grown out of the system, or more properly speaking, for want of any system whatever, in rendering awards and reports of committees. This, while applicable to all classes of exhibits, is more especially so as to live stock. All awards should be made on the basis of an established scale of points of excellence. Reports should give reasons for awards, by referring to points of excellence. Two judges with an umpire, and rigidly enforced rules forbidding consultation, is far preferable to the usual mode. When there are three or more one is generally out voted. When two are permitted to consult, one yields on this and the other on that, as a sort of compromise, or courtesy. Breeders of special lines or strains should not, as a rule, be permitted to act as judges.

Our fairs are too early to show to advantage our great staple product—corn. A corn exhibit should be held in connection with the annual winter meeting. In this, too, as in case of live stock there should be established a scale of excellence and corn judged by that.

In matter of speed it seems to me there is room for improvement. We have all come to agree upon some sort of speed system, and its being at least an adjunct to the fair exercises—that genuine speed and endurance are evidences of practical value. If so let us aim to obtain practical results.

With progress in art of training should follow progress in policy, or rather principle. The "saving record" policy should belong only to past ages, and should be stamped out by all high toned, gentlemanly horsemen. "Better the record, better the animal" should be the ruling motto among speed men and horses.

Let us have speed and endurance, and not mere jockeying. Say something like this, in addition to our usual speed exercise: Premiums for stallions of any age, or, if you please, specific ages, kept for service during the current year, owned in the

state, showing the best record mile heats against time, with the privilege of three trials, one, two or three days. This may not please the mere sporting fraternity ; but the people will like it. They want time and not agreed upon races.

As a new feature with us, I suggest a bench show in connection with our fairs. This will tend to weed out worthless curs and encourage useful and practical breeds of dogs.

I beg respectfully to renew a suggestion, that this Board cannot afford to content itself with the limited scope of work, embracing only annual fairs. These, of course, in their place, serve as great educators, and are therefore of value and indispensable. But the people and interests of the state call for more enlarged work. Provisions should be made to obtain and diffuse information monthly—quarterly at least—in the shape of statistics, showing the extent and condition of crops, prices, and such like. All other prosperous Boards embrace such in their line of work. Nebraska, in most features or factors agriculturally, is not only up with, but in the lead of other states. We should not be behind in this or anything else. Comparatively a small appropriation annually for supplies would enable your Secretary to perform this work. The present incumbent, while not courting increased duties or labors, would willingly take up this work if so directed. In fact, the now voluminous correspondence in matter of imparting constantly sought-for information of this character would be lessened rather than increased, and with more satisfactory results.

New breeds and strains in live stock are being brought into our state, requiring additional lots in near all these classes. It may be said they are few in number, and therefore ought not to be considered or provided for. In reply it can be truthfully said that one of the principal duties of this Board is to encourage all efforts in the improvement and introduction of valuable live stock in the state. Last year, with some doubts and honest difference of opinion, this Board provided for a new lot in horses. Since then it has become almost unanimous in other states and quite so among horsemen and breeders.

We greatly need, and in justice must have, scientific experimental agricultural and horticultural work in Nebraska. Our State Industrial College must, in some way, be endowed to this end. Able and willing hands are in charge of that institution, but without means. Both moral and financial influences should be brought to bear in this direction. Other states with less to present than us, are leading us in enterprise of this kind. The healthy, progressive tendency of the day is leaving behind the old plodding, groveling theories in agriculture. The living demand is for that which will point out the way to very largest possible maximum yields and returns, with the very least possible minimum toil of either brain or muscle, assigning all surplus labor for intellectual improvement and advancement.

In this connection I beg to earnestly call your attention to a measure now before Congress, providing for an annual appropriation of \$15,000 to each state for experimental purposes, known as the "Hatch Agricultural Experimental Station Bill." This Board should not only petition for the passage of this bill, but urge our State Legislature to memorialize Congress to the same end. If this Congressional measure may, by any possibility, fail, then the Nebraska Legislature should be importuned to provide for the Nebraska Industrial College as indicated. Too much importance or attention cannot be given this matter.

In reply to numerous applications for information concerning crops of 1886, more especially that of corn, I issued last fall the following brief circular:

NEBRASKA CORN CROP, 1886.

I am in receipt, daily, of letters, both in and out of the state, enquiring as to Nebraska corn crop outlook for 1886. Unfortunately, thus far, this office is not in possession of data in this respect, enabling me to furnish replies based on record facts. The State Board of Agriculture is now in condition to inaugurate a plan of collecting and diffusing such information, and will doubtless do so at its next meeting.

During the late state fair there was a general representation from all parts of the state, of practical farmers and others interested in and looking after crop prospects. Among such I took special care to make enquiry as to the crops of the current year. In addition, since the close of the state fair, I have spent three weeks traveling and attending county fairs. Referring to the corn crop, I feel warranted in expressing the belief that the average yield per acre of corn throughout the state, is below an average annual yield. The same, too, may be said, as a rule, referring to quality. The increased acreage, however, taking the state over, will more than over balance the decrease in acre yield. My conclusion is that there will be more bushels of corn in Nebraska for 1886 than ever before in any one year, and that the crop will yield a greater total cash value than any average year heretofore.

At each fair attended, I found the best corn specimens I have ever seen. These, of course, were the best obtainable, for exhibition purposes. Corn from the extreme western counties of the state is unusually good this year. The season with them, as a rule, has been propitious. The heretofore unwarranted expressed belief, by those unacquainted with facts, that farm crops could not be successfully grown west of the hundredth meridian, like a thousand other ethereal ideas conceived concerning western Nebraska and its soil products, has been put to rest—vanished in company with the Great American Desert theory, so prevalent in earlier days.

On the subject of farm industries in Nebraska I might with propriety extend, but will defer until my annual report at the close of the year. Sufficient now to say, that in matter of obtaining results from the soil, in the whole, there has been nothing this year to dishearten the industrious, intelligent, persistent husbandman.

ROBT. W. FURNAS,
Secretary Neb. State Board of Agriculture.

I am pleased to know that official reports since made to compilers of such statistics have more than corroborated my estimate. The corn in the state for last year is better and more of it than many had calculated.

Soon after the late state fair, I issued the following brief circular:

SPECIMENS OF NEBRASKA CORN WANTED FOR EXHIBITION AT THE
NATIONAL CAPITOL.

I want the best obtainable Nebraska grown corn specimens, to place in the rooms of the senate congressional committee on agriculture at Washington during the coming session of congress. I wish at least twelve ears *each* of all the leading and most valuable varieties of Dent, flint, sugar and popcorn, *in the husk*. Specimens should be fully matured, named, and as perfect in all essential characteristics as possible. Wrap each ear carefully in coarse paper, pack tight to prevent shelling, and send to me at Brownville, at my expense, any time before November 1, 1886. From that sent me an expert will select twelve of the best ears of each variety, which will be disposed of as indicated. The names and address of successful contributors will be placed on specimens for exhibition.

This plan of showing one of our staple products has been agreed upon between Senator Manderson and myself. We are sure it will be productive of good results. I trust the farmers of Nebraska will join in the effort. Let us hear not only from the old corn growing counties in the eastern part of the state, but from the west—particularly west of the hundredth meridian.

ROBT. W. FURNAS,
Secretary Nebraska State Board of Agriculture.

In response, fair contributions were made. Having a surplus for the purpose indicated, I took a small collection of each to the Great National Corn Show at Chicago in Nov. last, not for competition, but for mere exhibition. I will be pardoned for saying in behalf of our state, that no better specimens were on exhibition.

The collection referred to in the circular was forwarded to Washington city in December, in care of Senator Manderson, and is on exhibition in the Agricultural Committee rooms, both of the House and Senate, and in the rooms of printing.

The following are contributors whose specimens were sent to Chicago:

J. H. Bray	Pawnee county.
E. B. George	Lancaster county.
Eli Smith	Cuming county.
W. H. Fleming.....	Cuming county.
J. D. Kriekel.....	Brown county.
H. M. Smith.....	Washington county.
John Blessing.....	Dakota county.
D. H. Hudson.....	Garfield county.
Elijah Allen	Douglas county.
J. H. Bretz.....	Antelope county.
J. L. Diffenderfer	Wheeler county.
William Russell.....	Nemaha county.
Frank Redfern	Nemaha county.
Indian Industrial School.....	Nance county.

Under your appointment, I again served as delegate to Chicago in Nov. last, in matter of "Western Fair Circuit." The organization effected in 1885 was continued with renewed interest and acknowledgments of its good results. The dates agreed upon for 1887, subject of course to the approval of the respective Boards, are: Iowa, Sept. 5th. Wisconsin and Nebraska, Sept. 12th. Kansas, Sept. 19th. Illinois, Sept. 20th. St. Louis, Mo., Oct 3d. This, it will be seen, is the same week in Sept. used by the Nebraska state fair for three years past. The officers and standing committees for 1887 are the same as for 1886, viz :

ROBT. W. FURNAS, Nebraska, President.

CHAS. F. MILLS, Illinois, Secretary.

F. J. WADE, Missouri, Committee on Fees and Privileges.

H. C. WHEELER, Iowa, on Advertising.

CHAS. F. MILLS, Illinois, on Classification.

C. M. SANGER, Wisconsin, on Tickets.

G. Y. JOHNSON, Kansas, on Transportation.

Acting further under your appointment as delegate, I also attended the annual meeting of the International Association of Fairs and Expositions, Chicago, Dec. 15 and 16 last. Such and like convocations are productive of most valuable results. Through them we learn by comparison ; we are taught, and we teach ; ways and means are devised by which we become wiser, better and more useful managers.

All the best and most successful state and other minor kindred organizations are members and participants. This Association should be a permanent member. Prompted by this view, as your delegate, I exercised the discretionary power of making the Nebraska State Board of Agriculture a member, and submit my action for your consideration.

The management of the National Trotting Association was thoroughly discussed by delegates from all parts of the United States, and resulted in the unanimous adoption of the following resolution.

Resolved, That the best interests and the fair conduct of speed trials all over the country require the formation of a new association for the regulation of the same, independent of any like association now in existence. And this Association, which includes premiums for speed in its catalogue, will heartily aid such movement.

I am quite sure a large majority of the most important and best managed speed tracks will not only join in the movement, but withdraw from the old one.

In compliance with your instructions, at the last annual meeting, I have transferred the library and archives, formerly in the hands of my predecessor, from Plattsmouth to Lincoln. An invoice of the same is herewith submitted. They are still in boxes, unpacked and stored, no place as yet having been found for them. The state authorities promise a room as soon as the new Capitol building is complete.

By order of the Board of Managers, I have opened an account with the Treasurer. The following items stand to his debit:

Amount turned over by Ex-Treasurer Hartman.....	\$ 9938.38
Interest on state warrant.....	11.70
Stall rent collected for 1885	8.50
General admission tickets, fair 1886.....	11290.50
Amphitheatre receipts, 1886.....	2444.75
Quarter stretch tickets, 1886.....	332.00
Receipts, booth privileges, 1886.....	3787.25
Receipts, camping permits, 1886.....	87.00
Receipts, speed money, 1886.....	2155.00
Receipts, stall rents, 1886.....	650.00
Receipts, hack stands, 1886.....	600.00
Receipts, ads. in premium list, 1886.....	255.00
Receipts, B. & M. R. R. coupons, 1886.....	6468.50
Receipts, U. P. R. R. coupons, 1886.....	1836.00
Receipts, M. P. R. R. coupons, 1886.....	588.00
Receipts, F. E. & M. R. R. coupons, 1886.....	40.50
Receipts, S. P. & S. C. R. R. coupons, 1886.....	47.50
Receipts, state apportionment, 1886.....	2000.00
Rebate, warrant 46.....	41.00
Rebate, warrant 351.....	9.50
Rebate, warrant 224.....	1.00
Rebate, sawdust.....	10.00
Receipts, score card.....	65.00
Amount received National Trotting Association.....	4.03

Total.....\$42671.11

The list of warrants here presented are to his credit, showing a balance on hand to date of this report of \$8,917.86. The Treasurer's report and my account, it will be found, correspond.

The annual fair and exposition held by the Board, Lincoln, September 10th to 17th, 1886, like its immediate predecessor, was in all respects a grand success, and highly appreciated by the fair going people in and out of the state. In many features it was far superior to any of its predecessors. As will be seen by reference to detailed statement of expenditures, herewith submitted, the demand for improvements on the grounds, to accommodate the wants of the fair, and which were made by the Board, were greater than usual. Hence a smaller unexpended balance remains in the Treasury to date, this year, than for last.

The annual report for publication is near ready for the printer. The reports from the counties are yet to compile. I mean, in addition, to embrace all possible obtainable industrial statistics. To this end circulars have been sent throughout the state.

It is always of interest to, and in demand by, the public to know more in detail, than general reports show, how and for what expenditures are made. The following summary will, in the main, furnish such desired information :

Paid, 1886, for lumber, hardware, labor, and expended in permanent improvements on fair grounds, \$4,394.98.

Paid, police, pay rolls, forage, hauling, sprinkling, ice, and other incidental expenses of the fair grounds for the year, \$4,431.44.

Paid, premiums, including speed, \$14,989.50.

Paid, printing, advertising, and other incidentals connected therewith, \$3,230.08.

Paid, fixed and incidental salaries to officers, superintendents of classes, and judges, \$3,636.19.

Paid, hotel bills of members of the State Board, committees, and judges, \$1,085.10.

Paid freight, express postage and telegraphing, \$483.24.

Paid, attractions, chariot races, band and like, \$650.

Paid, miscellaneous, medals, diplomas, livery, and rent, \$323.58.

As your Secretary—the "Keeper of Records" if you please—the one coming more directly and intimately in contact with "the powers that be," outside our own organization, I would be culpably remiss in duty did I fail in this public manner to render proper acknowledgment to both the press and railroad managements of the state for most valuable and generous aid given the Board, and more especially the fair. Without these agencies no enterprise the character of ours can succeed. They have not only done all, but in instances more than asked. We recognize and invoke their "good offices."

LIST OF WARRANTS DRAWN FOR THE YEAR 1886.

DATE.	TO WHOM DRAWN.	NO.	FOR WHAT DRAWN.	AMT.	AMT.
Jan. 20.....	D. H. Wheeler & Co....	1	Rent Library Room 1885.....	\$ 60 00	
	Julius Smith.....	2	Hotel bill 1885.....	8 50	
Jan. 21.....	H. Brunstetter.....	3	" ".....	2 50	
	State Hort. Society.....	4	Premis 1884-1885.....	.....	\$2235 50
	C. H. Glover.....	5	Hotel bill 1885.....	6 75	
	O. M. Druse.....	6	Heat and gas Rep. Hall.....	5 00	
	Stewart-Chute Lum.Co.	7	Lumber, Fair 1885.....	274 52	
	F. H. Young.....	8	Hotel bill 1885.....	5 50	
	Windsor Hotel.....	9	Board members 1885.....	56 00	
Feb. 4.....	R. W. Furnas.....	10	First quarter's salary.....	500 00	
Feb. 17.....	R. Daniels.....	11	Premiums 1885.....	.....	20 00
	Commercial Hotel.....	12	Board, January, 1886.....	222 25	
	A. Humphrey.....	13	Expenses to Indianapolis.....	35 80	
	J. B. Dinmore.....	14	" ".....	47 85	
Feb. 18.....	Windsor Hotel.....	15	Board members.....	12 50	
	F. H. Wilson.....	16	Packing and shipping library.....	15 75	
	Bohnan Bros.....	17	Hauling, Fair 1885.....	4 00	
	Chas. Lutz.....	18	" ".....	8 00	
	R. W. Furnas.....	19	Sundries—see bill.....	15 90	
	Cancelled.....	20	.....	.....
	D. O. Cross.....	21	Postage.....	10 42	
	W. H. Davis.....	22	Express and telegraph.....	12 81	
Feb. 19.....	John Leppan.....	23	Arbor Day premium.....	.....	8 60
	Wm. Robinson.....	24	" ".....	.....	40 00
	A. C. McClean.....	25	" ".....	.....	24 00
	Lincoln News.....	26	Advertising.....	10 00	
Feb. 26.....	W. H. Barstow.....	27	Exp. Nat. Trot. Ass'n.....	22 25	
March 1.....	Festus J. Wade.....	28	Fee Nat. Fair Ass'n.....	10 00	
March 2.....	Peter L. Krider.....	29	Medals and Dft.....	19 30	
	C. H. Ballinger.....	30	Premium, ram lamb, lot 2, 1885.....	.....	4 00
March 18.....	Lillibridge & Roose.....	31	Filling diplomas.....	70	
	O. M. Druse.....	32	Freight and cartage library.....	3 10	
	Oliver Maggs & d.....	33	Hauling boiler.....	1 50	
May 5.....	R. W. Furnas.....	34	Travelling and hotel expenses.....	6 55	
	D. O. Cross.....	35	Postage.....	30 65	
	W. H. Moore.....	36	Repairing show cases.....	1 75	
	W. H. Davis.....	37	Express, freight, and telegraph.....	47 74	
	Arkwright & Curzon.....	38	Engraving.....	2 50	
	J. J. Imhoff.....	39	Hotel bill.....	3 75	
May 6.....	James H. Reall.....	40	Aid to dairy.....	10 10	
May 28.....	C. E. Bessey.....	41	Botany expense.....	10 00	
June 4.....	D. O. Cross.....	42	Postage.....	48 00	
June 9.....	Lillibridge & Roose.....	43	Harvey diploma.....	5 00	
June 30.....	R. W. Furnas.....	44	Second quarter's salary.....	500 00	
July 5.....	Wolf & Co.....	45	Hangers.....	42 50	
July 14.....	J. D. Macfarland.....	46	Work on amphitheater.....	500 00	
July 15.....	Chicago Horseman.....	47	Adv. speed.....	26 00	
July 19.....	Chicago Lumber Co.....	48	Lumber.....	615 41	
Aug. 2.....	Omaha Republican.....	49	Printing.....	461 59	
	Cancelled.....	50	.....	.....
Aug. 3.....	J. D. Macfarland.....	51	Labor and lumber.....	775 75	
Aug. 4.....	Wolf & Co.....	52	Hangers and exp.....	43 55	
	W. T. Moore.....	53	Express.....	4 70	
	R. W. Furnas.....	54	Incidentals.....	54 50	
	D. O. Cross.....	55	Postage.....	46 49	
	W. H. Davis.....	56	Express, freight, and telegraph.....	110 78	
	Aug. Gast & Co.....	57	Hangers 1886.....	434 25	
	Cancelled.....	58	.....	.....
	Dunton.....	59	Advertising.....	18 00	
Aug. 18.....	S. A. Browne & Co.....	60	Lumber.....	470 33	
Aug. 21.....	Thos. Mulvahl.....	61	Posting bills, bd. man.....	94 61	
Aug. 24.....	H. Perkins.....	62	Speed—see p. 91 Records.....	.....	9 00
Aug. 26.....	W. H. Barstow.....	63	Exp. advertising.....	50 00	
Sept. 1.....	Thos. Vall.....	64	Fine "Willie C".....	21 00	
Sept. 14.....	Pat McEvoy.....	65	Speed.....	.....	178 00
	D. D. Johnson.....	66	" ".....	76 00	
	J. D. Macfarland.....	67	" ".....	76 00	
	G. H. Vance.....	68	" ".....	222 00	
	O. J. Stowell.....	69	" ".....	92 05	
	S. C. Ewing.....	70	" ".....	210 50	
	Wade Carey.....	71	" ".....	87 50	
	C. E. Abbott.....	72	" ".....	52 00	
	Harvey Pickrell.....	73	" ".....	90 00	
	Henry Perkins.....	74	" ".....	87 50	

DATE.	TO WHOM DRAWN.	NO.	FOR WHAT DRAWN.	AMT.	AMT.
Sept. 14...	C. M. Lampson.....	75	Speed		\$ 22 50
	Douglas Co. Ag. Soc.....	76	Premium		80 00
Sept. 15...	Kearney Co. Ag. Soc.....	77	"		1 00
	Valley Co. Ag. Soc.....	78	"		60 00
	M. O. Riley.....	79			
Sept. 16...	C. E. Abbott.....	80	Speed		180 00
	N. F. Chamberlain.....	81	"		150 00
	R. H. Davis.....	82	"		75 00
	Geo. Gross.....	83	Premiums.....		15 20
	D. D. Johnson.....	84	Speed		45 00
	K. Kretschmer.....	85	"		62 50
	J. H. Masters.....	86	Premiums.....		34 40
	C. E. Mayne.....	87	"		8 00
	J. S. Moles & Co.....	88	Speed		216 00
	J. E. Nicholson.....	89	"		50 00
	H. Pickrell.....	90	"		120 00
	C. E. Smith.....	91	"		30 00
	Cancelled.....	92	"		37 50
	A. L. Tower.....	93			
	Union Stock Farm.....	94	Premiums.....		4 00
	J. A. Bailey.....	95	Speed		90 00
	Hamlin & Ford.....	96	Painting.....	\$217 61	
	S. W. Chapman.....	97	Speed		250 00
	J. Newbro.....	98	"		150 00
	J. D. Creighton.....	99	"		300 00
	Geo. Gross.....	100	"		125 00
Sept. 17...	D. P. Ashburn.....	101	"		75 00
	E. Bose.....	102	Premiums.....		16 00
	A. G. Porter.....	103	"		4 00
	J. L. Courtier.....	104	"		8 00
	H. Pickrell.....	105	Speed		50 00
	W. H. Francis.....	106	Bal. Novelty Race 1885.....		75 00
	C. E. Mayne.....	107	Speed		30 00
	J. Newbro.....	108	"		252 00
	J. D. Macfarland.....	109	Bill rendered per Bd. Managers.....	90 00	
	R. S. Maloney, Jr.....	110	Speed		500 00
	L. J. Rogers.....	111	"		105 00
	Geo. H. Silvernail.....	112	Premiums.....		8 00
	Martin Scherer.....	113	"		4 00
	Supt. Gates & Tickets.....	114	"		4 00
	Sutton Creamery Co.....	115	Pay roll.....	20 50	
	A. C. Tucker.....	116	Premiums.....		12 80
	Table Rock Cream. Co.....	117	Speed		1 00
	Treasurer.....	118	Premiums.....		5 60
	R. K. Payne.....	119	Pay roll.....	207 50	
	N. S. Olin & Son.....	120	Premiums.....		100 00
	J. D. Creighton.....	121	"		68 00
	Wade Carey.....	122	Speed		100 00
	J. Newbro.....	123	"		240 00
	"	124	"		60 00
	"	125	"		600 00
	C. E. Abbott.....	126	"		250 00
	A. C. Tucker.....	127	"		150 00
	J. L. Courtier.....	128	"		62 50
	H. Pickrell.....	129	"		62 50
	A. McDonald.....	130	Chariot races.....	400 00	
	T. Rockhold.....	131	Speed		15 00
	C. Ward.....	132	"		60 00
	I. J. Starbuck.....	133	"		60 00
	Shockey & Gibb.....	134	Premiums.....		372 00
	S. L. Green.....	135	Speed		25 00
	Geo. Gross.....	136	"		150 00
Sept. 18...	Graham P. Brown.....	137	Premiums.....		114 00
	M. O. Riley.....	138	Speed		62 50
	I. J. Starbuck.....	139	Premiums.....		18 00
	J. W. Dean.....	140	"		104 00
	Cancelled.....	141			
	F. Bellows.....	142	Premiums.....		20 00
	Signor Yates.....	143	Trapeze performance.....	50 00	
	Crow & Bellows.....	144	Premiums.....		112 00
	A. I. Gray.....	145	Band.....	200 00	
	A. J. Poppleton.....	146	Speed		15 00
	P. McEvoy.....	147	Premiums.....		36 00
	Wicks Refrigerator Co.....	148	Refrigerator.....	450 00	

STATE BOARD OF AGRICULTURE.

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DATE.	TO WHOM DRAWN.	NO.	FOR WHAT DRAWN.	AMT.	AMT.
Sept. 18....	L. Miller.....	149	Premiums.....		\$196 00
	J. F. Stanhope.....	150	Hardware.....	\$ 1 50	
	J. X. Griffith.....	151	Premiums.....		80 80
	James Hamilton.....	152	Police.....	811 50	
	Jacob Lemon.....	153	Premiums.....		4 00
	W. H. Chandler.....	154	".....		2 40
	E. F. Kleinmeyer.....	155	".....		36 00
	E. P. Davis.....	156	Booths.....	425 25	
	".....	157	Christian Church.....	33 33	
	".....	158	Commercial Dining Hall.....	19 00	
	Parson & Hoover.....	159	Booths.....	20 00	
	".....	160	Painting.....	12 02	
	Wm. Singmaster.....	161	Premiums.....		88 00
	Wm. Burgess.....	162	".....		16 04
	Wm. Singmaster.....	163	".....		4 00
	King & Dobbins.....	164	Printing.....	32 75	
	F. H. Dunton.....	165	Advertising.....	15 00	
	Fremont Foundry Co.....	166	Power.....	100 00	
	W. H. Berger.....	167	Sprinkling.....	131 00	
	S. M. Barker.....	168	Detectives.....	150 00	
	Mrs. S. C. Langworthy.....	169	Sundries—Art Hall.....	2 70	
	John Holliday.....	170	Labor.....	14 25	
	Davis & Congill.....	171	Ticket boxes.....	25 00	
	L. E. Benton.....	172	Labor.....	12 00	
	J. D. Macfarland.....	173	Premiums.....		32 00
	".....	174	".....		16 00
	W. D. Mann.....	175	Labor.....	191 00	
	H. Pickrell.....	176	Premiums.....		28 00
	W. R. Clark.....	177	Expense Class 1.....	90 00	
	J. F. Marshall.....	178	Premiums.....		32 00
	W. R. Bowen.....	179	Gate-keeper, pay roll.....	9 00	
	M. A. Richard.....	180	Pumping.....	1 50	
	A. G. Hastings.....	181	Expense Art Hall.....	69 00	
	Wm. Gill.....	182	Premiums.....		16 00
	C. V. Holden.....	183	".....		24 00
	<i>Cancelled</i>	184	".....		
	O. M. Druse.....	185	Expense.....	2 70	
	L. N. Rosa.....	186	Speed.....		37 50
	Myers, Nissley & Co.....	187	Material Art Hall.....	8 05	
	J. G. Duhling.....	188	Premiums.....		12 00
	C. A. Gesselman.....	189	".....		3 50
	John Eisenbach.....	190	".....		2 40
	Lorenza Marr.....	191	".....		2 40
	W. D. Wildman.....	192	".....		7 00
	James Hamilton.....	193	Police.....	69 50	
	P. H. Cooper.....	194	Ice.....	48 00	
	Wm. Dunlap.....	195	Labor, advertising.....	45 00	
	R. T. Rainey.....	196	Postage.....	29 25	
	Eli A. Barnes.....	197	Sundries—Agricultural Hall.....	7 50	
	B. O. Rhoades.....	198	Expense Council Bluffs.....	25 00	
	A. Adams.....	199	Blacksmithing.....	56 10	
	W. H. Davis.....	200	Express and telegraph.....	53 89	
	W. U. Telegraph Co.....	201	Telegraphing.....	21 99	
	Hutchins & Hyatt.....	202	Sawdust.....	45 00	
	James Hamilton.....	203	Chief Police and Assistant.....	175 00	
	W. D. Mann.....	204	Carpenter work.....	172 80	
	<i>Omaha Republican</i>	205	Advertising.....	42 00	
	<i>Omaha Herald</i>	206	".....	36 75	
	R. L. Smith.....	207	Repair shafting.....	4 75	
	<i>Omaha Bee</i>	208	Advertising.....	78 30	
	D. P. Sutton.....	209	".....	5 00	
	Huyck Brothers.....	210	".....	3 10	
	Ensign & Tyrall.....	211	Hay, etc.....	7 35	
	A. McDonald.....	212	".....	4 00	
	Huyck Bros.....	213	Bill posting.....	2 70	
	L. A. Kent.....	214	For exhibitors.....		16 80
	J. B. Thompson.....	215	Premiums.....		44 00
	L. A. Kent.....	216	" exhibitors.....		4 00
Sept. 19....	Geo. F. Warren.....	217	Clerk.....	40 00	
Sept. 20....	G. F. Dickman.....	218	".....	72 00	
	F. H. Wilson.....	219	Services Assistant Secretary.....	110 00	
	T. Friedhoff.....	220	Premiums.....		16 00
	Geo. G. Furnas.....	221	Clerk.....	88 00	
	John Gillespie.....	222	".....	57 00	

DATE.	TO WHOM DRAWN.	NO.	FOR WHAT DRAWN.	AMT.	AMT.
Sept. 20.	Emma Gillespie.....	223	Clerk.....	\$ 54 00	
	Homer Honeywell.....	224	Messenger.....	18 00	
	W. W. Watson.....	225	Clerk.....	12 00	
	T. R. Hamlin.....	226	Expenses Assistant Superintendent.....	25 75	
	A. H. Hutton.....	227	Premiums.....		\$ 15 00
	J. H. Miller & Son.....	228	Supplies.....	8 90	
	May L. Roberts.....	229	Premiums.....		3 00
	A. M. Gardner.....	230	".....		16 00
	J. H. Smith.....	231	Straw.....	164 27	
	S. M. Barker.....	232	Salary and exp. account.....	220 75	
	Lew Franklin.....	233	Premiums.....		2 00
	W. P. Dakin.....	234	".....		3 00
	C. N. Dietz.....	235	Lumber.....	278 02	
	Bohanan Bros.....	236	184 bus tickets.....	26 80	
	Thornburn Sisters.....	237	Premiums.....		2 00
	J. B. Dinmore.....	238	Allowance Board Managers.....	187 50	
	Ed. McIntyre.....	239	".....	250 00	
	E. N. Grennell.....	240	".....	187 50	
	A. B. Nicodemus.....	241	".....	187 50	
	M. Dunham.....	242	".....	187 50	
	Frank Rollins.....	243	Livery.....	9 00	
	Ida B. Day.....	244	Premiums.....		1 00
	H. B. Nicodemus.....	245	Exp. Fair.....	6 75	
	M. Dunham.....	246	Exp. Board Managers.....	6 50	
	Ed. McIntyre.....	247	".....	27 45	
	Frank Pearson.....	248	Superintendent track.....	15 00	
	E. N. Grennell.....	249	Exp. Board Managers.....	28 75	
	J. J. Jensen.....	250	Exp. Des Moines.....	15 00	
	W. H. Barstow.....	251	Exp. on road adv.....	87 00	
	Windsor Hotel.....	252	Board bill.....	56 00	
	".....	253	".....	103 50	
	C. Scully.....	254	Assistant Superintendent speed.....	10 00	
	R. W. Furnas.....	255	Incidentals—see bill.....	22 55	
	Capital Hotel.....	256	Board bill.....	419 00	
	Joe Burns.....	257	Work Fish House.....	20 02	
	A. F. Holliday.....	258	Premiums.....		4 00
	S. J. Odell.....	259	".....		4 00
	John Ivers.....	260	Oats.....	15 00	
	Adams Co. Democrat.....	261	Advertising.....	4 05	
	Mrs. W. E. Gosper.....	262	Ribbon.....	80 85	
	Mrs. O. M. Iruso.....	263	Premiums.....		2 00
	Mrs. C. Madden.....	264	".....		3 00
	W. G. Houtz.....	265	".....		8 00
	G. M. Traver.....	266	Cambric.....	16 90	
	D. O. Cross.....	267	Postage.....	9 58	
	Pacific Express Co.....	268	Express.....	11 85	
	J. B. Dinmore.....	269	Exp. Des Moines.....	17 75	
	J. & R. Maggard.....	270	Cartage.....	3 00	
	Ed. Pyle.....	271	Speed.....		58 50
	H. W. Hardy.....	272	Chairs and stools.....	79 08	
	Evening News.....	273	Advertising and job work.....	66 40	
	Telephone Co.....	274	Telephone.....	26 30	
	Mrs. C. Thomas.....	275	Premiums.....		1 00
	Fannie Latham.....	276	".....		7 00
	Mrs. E. P. Ewing.....	277	".....		6 00
	J. C. McBride.....	278	Meal tickets.....	125 60	
	State Journal Co.....	279	Printing.....	1485 10	
	W. G. Bohanan.....	280	Livery.....	2 00	
	".....	281	".....	16 00	
	Prairie Farmer.....	282	Advertising.....	56 00	
	Wm. O'Neill.....	283	Labor.....	150 00	
	W. H. Arnault.....	284	".....	4 00	
	M. L. Trester.....	285	Premiums.....		10 40
	Joseph O'Pelt.....	286	Board bill.....	54 25	
	Clara A. Walsh.....	287	Premiums.....		3 00
	A. L. Sullivan.....	288	".....		192 00
	A. Humphrey.....	289	Pay General Superintendent.....	100 00	
	O. M. Druse.....	290	Superintendent transportation.....	100 00	
	W. R. Bowen.....	291	Gate-keepers.....	50 00	
	Mrs. S. C. Langworthy.....	292	Superintendent.....	25 00	
	Ella R. Cooper.....	293	".....	40 00	
	W. H. Clark.....	294	".....	25 00	
	H. B. Nicodemus.....	295	Superintendent gates.....	50 00	
	D. V. Stephenson.....	296	Superintendent.....	25 00	

DATE.	TO WHOM DRAWN.	NO.	FOR WHAT DRAWN.	AMT.	AMT.
Sept. 21....	G. Ensign.....	297	Livery.....	\$120 20	
	J. C. McBride.....	298	Balance.....	78	
	Hannah Baitz.....	299	Premiums.....		\$ 2 00
	Mrs. Dr. Fuller.....	300	".....		8 00
	Ed. Pyle.....	301	".....		72 00
	C. J. Ernst.....	302	Drayage.....	2 50	
	B. O. Rhoades.....	303	Services.....	30 00	
Sept. 24....	W. D. Mann.....	304	Labor.....	140 00	
	R. W. Furnas.....	305	Third quarter's salary.....	500 00	
	H. C. Stoll.....	306	Premiums.....		20 00
	".....	307	".....		188 00
Sept. 25....	John B. Housel.....	308	".....		8 00
	S. S. Borton.....	309	".....		12 00
	Frank H. Bennett.....	310	".....		5 00
	Mrs. G. F. Betts.....	311	".....		2 00
	M. K. Stanley.....	312	".....		20 00
	Mrs. H. D. Rhea.....	313	".....		3 00
	Stella Jerome Prager.....	314	".....		9 00
Sept. 27....	Mrs. C. Bruce.....	315	".....		7 20
	G. F. Warren.....	316	Clerk hire.....	8 00	
	J. S. Hawes.....	317	Premiums.....		68 00
	L. B. Wilson.....	318	".....		32 40
	Geo. Cross.....	319	".....		66 00
	J. J. Barker.....	320	".....		16 00
	Trinder & Groff.....	321	".....		16 00
	L. E. Shattuck.....	322	".....		158 40
	J. R. Lawson.....	323	".....		32 00
	R. Daniels.....	324	".....		172 00
	chnulz Bros.....	325	".....		71 20
	Sidney Risk.....	326	".....		12 00
	C. H. Ballinger.....	327	".....		182 80
	Claudius Jones.....	328	".....		32 00
	Henry Peck.....	329	".....		40 00
	Howard Bros.....	330	".....		40 00
	M. M. Coad.....	331	".....		44 40
	E. C. Hill.....	332	".....		40 00
	C. M. Sears.....	333	".....		38 40
	Samuel Clark.....	334	".....		44 00
	Judd & Stratton.....	335	".....		48 00
	J. Fitzgerald.....	336	".....		48 00
	ylvester Andrews.....	337	".....		28 00
	Wm. Westlake.....	338	".....		67 20
Sept. 30....	Odgers & Horton.....	339	".....		28 00
Oct. 4.....	O. W. Webster.....	340	".....		4 00
Oct. 5.....	Odgers & Horton.....	341	".....		4 00
	T. J. Vail.....	342	Due National Trotting Association.....	56 00	
	Robt. Miller.....	343	Hotel bill.....	15 00	
	B. & M. R. K.....	344	Switching.....	98 00	
	A. Adams.....	345	Work.....	2 50	
	Oliver Maggard.....	346	Hauling.....	27 50	
	Cancelled.....	347	".....		
	Chicago Horseman.....	348	Advertising.....	18 00	
	J. B. McDowell.....	349	Labor.....	12 00	
	American Ex. Co.....	350	Express.....	4 50	
Oct. 6.....	L. A. Kent, Treas.....	351	Premiums.....		723 10
Oct. 7.....	Sutton Creamery Co.....	352	Balance premiums.....		20 00
	Mrs. M. A. McComas.....	353	Premiums.....		3 00
Oct. 8.....	Palmer Way.....	354	Pipe and labor.....	8 25	
	Dinges & McGahey.....	355	Cartage.....	1 50	
	S. E. Moore.....	356	Posting bills.....	9 00	
Oct. 9.....	The World.....	357	Advertising.....	24 80	
Oct. 11....	H. W. Hebbard.....	358	Telegraphing.....	2 26	
	C. E. Wiester.....	359	Freight, express, and telegraph.....	23 15	
	Eli A. Barnes.....	360	Balance pay roll.....	13 50	
Oct. 23....	E. P. McCraney.....	361	Premiums.....		2 00
Oct. 27....	Vet. Jelinek.....	362	".....		8 00
Oct. 30....	E. F. Kleinfmeyer.....	363	".....		20 00
Nov. 5.....	Mat. Bracken.....	364	Plowing.....	7 50	
	S. L. Sand.....	365	Labor.....	1 50	
	Fisher & Westover.....	366	Hardware.....	11 28	
	J. E. Douglass.....	367	Labor.....	24 00	
	Chicago Lumber Co.....	368	Lumber.....	148 48	
	Dean & Horton.....	369	Plumbing.....	820 71	
	Humphrey Bros.....	370	Hardware.....	248 68	

DATE.	TO WHOM DRAWN.	NO.	FOR WHAT DRAWN.	AMT.	AMT.
Nov. 5.....	Gibson, Miller & Richardson.....	371	Diplomas.....	\$ 30 00	
	Mrs. W. P. Jones.....	372	Exp. Ed. department.....	25 00	
	Charley Miller.....	373	Labor.....	10 00	
	Gazette Journal Co.....	374	Advertising.....	5 00	
	Peter L. Krider.....	375	Medals and Ex.....	10 45	
	E. T. Rainey.....	376	Postage.....	5 20	
	H. W. Furnas.....	377	Sundries.....	10 75	
	C. F. Wiester.....	378	Express, telegraph, and freight.....	20 40	
	J. E. Shepherd.....	379	Arbor Day premiums 1884.....		\$ 50 00
	State Hort. Society.....	380	Premiums 1886.....		951 60
Nov. 6.....	Miss E. Williams.....	381	Premiums—duplicate.....		2 00
	Mrs. E. A. Hawke.....	382	".....		2 00
	Mrs. E. N. Hinman.....	383	".....		1 00
Nov. 8.....	J. W. Gavitt.....	384	".....		32 00
	F. Bellows.....	385	".....		16 00
	L. A. Kent, Treas.....	386	Premiums—no comp.....		421 00
	Tom Mulvahill.....	387	Advertising.....	7 60	
Nov. 9.....	Mrs. E. C. Arnold.....	388	Premiums.....		2 00
Nov. 20.....	C. H. Ballinger.....	389	".....		136 80
Nov. 23.....	J. H. Gardner.....	390	".....		4 00
Dec. 7.....	H. W. Furnas.....	391	Fourth quarter's salary 1886.....	500 00	
Dec. 4.....	Mary J. Rietz.....	392	Premiums.....		1 00
Dec. 9.....	Mrs. S. C. Clark.....	393	".....		2 00
	Amanda Heppner.....	394	".....		2 00
	Alice O'Conner.....	395	".....		1 00
	Mary T. Spehn.....	396	".....		2 00
Dec. 10.....	L. Kinsman.....	397	Premiums—no comp.....		2 40
	U. B. Daily.....	398	Speed.....		6 00
Dec. 20.....	Beatrice Canning Co.....	399	Premiums.....		18 00
	J. H. Nichols.....	400	Painting.....	9 25	
	Pace & Williams.....	401	Electrotype.....	4 00	
Dec. 31.....	Sarah W. Moore.....	402	Premiums.....		3 20
Total premiums.....				\$15,077 90	
Total expenses.....				18,748 58	
Total.....					\$33,26 488

Treasurer Kent then presented his annual report as follows:

TREASURER'S REPORT.

LINCOLN, NEBRASKA, January 18th, 1887.

Mr. President and Gentlemen of the State Board:

As your treasurer for the past year, I submit to you the following report of the financial condition of the treasury at the close of the year:

RECEIPTS FROM ALL SOURCES.

Received from Ex-Treasurer Hartman.....	\$ 9938 38
“ interest on state warrant.....	11 70
“ stall rent, year..... 1885	8 50
“ general admission tickets..... 1886	11290 50
“ amphitheater tickets..... “	2444 75
“ quarter stretch ticket..... “	332 00
“ booth privileges..... “	3787 25
“ camp permits..... “	87 00
“ speed money..... “	2155 00
“ stall rents..... “	650 00
“ hack stands..... “	600 00
“ Advertising in premium list..... “	255 00
“ B. & M. R. R. coupons..... “	6468 50
“ U. P. R. R. coupons..... “	1836 00
“ M. P. R. R. coupons..... “	588 00
“ F., E. & M. V. R. R. coupons..... “	40 50
“ S. P., M. & O. R. R. coupons..... “	47 50
“ state apportionments..... “	2000 00
“ rebate on warrant No. 46..... “	41 00
“ “ “ No. 351..... “	9 50
“ “ “ No. 224..... “	1 00
“ “ sawdust account... “	10 00
“ score cards..... “	65 00
“ National Trot. Association... “	4 03
Total receipts.....	\$42671 11

DISBURSEMENTS.

Warrant No. 244, 1885 series.....	\$ 2 50
Warrants No. 1, to No. 401, inclusive.....	33696 60
Total expenditures.....	\$33699 10 \$33699 10

Net balance in treasury, January 18, 1887..... \$8972 01

The reason of my account showing a greater balance on hand than does that of the Secretary arises from the fact that he has given me credit for warrants Nos. 171, 207, 209, 213, 283, 326 and 402, which have not been presented to me for payment. All of which is respectfully submitted.

LEWIS A. KENT,
Treasurer.

The Treasurer's report and the financial portion of the Secretary's report were referred to a committee consisting of J. Jensen, of Fillmore county; R. H. Henry, of Platte county, and James W. Eaton, of Otoe county.

The President's address and that portion of the Secretary's report not financial were referred to a committee consisting of J. B. McDowell, of Jefferson county; W. L. May, of Dodge county, and A. E. Powers, of Frontier county.

Messrs. May and Powers being called away before the completion of the report, R. R. Green, of Buffalo county, and W. H. Paton, of Nance county, were, by the President, appointed as substitutes.

In due time the committee reported as follows, which report was adopted:

COMMITTEE'S REPORT.

LINCOLN, NEBRASKA.

Gentlemen of the State Board of Agriculture:

Your committee appointed to report on the President's address and Secretary's report respectfully submit the following:

After a careful consideration of both, we recommend that the Board tender its thanks to the President for his able address, and that the report of the Secretary be adopted.

Your committee would respectfully urge on the Board the importance of acting on the various recommendations made by the Secretary, and especially the suggestions that the Board memorialize Congress, by petition, for the passage of the "Hatch Agricultural Experimental Station Bill," and also urge on the State Legislature to memorialize Congress to the same end, and also urge upon the Legislature to make an appropriation for the Nebraska Industrial College.

Respectfully submitted,

W. H. PATON.
J. B. McDOWELL.
R. R. GREER.

January 21, 1887.

On motion of Mr. Jensen, the following nominations to fill vacancies on the Board were made and referred to a committee consisting of J. E. North, Platte county; J. D. Macfarland, Lancaster county; R. R. Greer, Buffalo county; S. H. Webster, Valley county, and G. F. Warren, Clay county.

NOMINATIONS FOR VACANCIES.

R. W. Furnas, Nemaha; Frank Holt, Gage; E. A. Barnes, Hall; M. Dunham, Douglas; E. N. Grennell, Washington; R. Daniels, Sarpy; J. B. Dinsmore, Clay; J. Jensen, Fillmore; Fred Gorder,

Cass; G. M. Humphrey, Pawnee; J. S. Hughes, Hayes; R. H. Henry, Platte; O. M. Druse, Lancaster; James Stewart, Madison; D. H. Wheeler, Douglas; J. M. Burks, Lancaster; R. W. Blake, Brown; Austin Humphrey, Lancaster; W. H. Barstow, Hamilton; Chas. T. Griffen, Burt; A. W. Buffen, Johnson; H. C. Jones, Frontier; W. H. Smith, Saline; Wm. Gill, Seward; Henry Fry, York; A. V. S. Saunders, Gage.

The following communication from the Omaha Fair and Exposition was read, and a committee of conference appointed, consisting of Ed. McIntyre, of Seward county; W. E. Hill, of Otoe county; E. N. Grennell, of Washington county; J. M. Lee, of Buffalo county; J. M. Burks, of Lancaster county:

COMMUNICATION.

OMAHA, NEB., January 12, 1887.

At a meeting of the board of directors of the Omaha Fair and Exposition Association, held this day, it was

Resolved, That this board, with the addition of Daniel H. Wheeler, secretary, be constituted a committee to attend the annual meeting of the Nebraska State Board of Agriculture, to be held in Lincoln, Tuesday, January 18th, 1887, for the purpose of conferring with said State Board and discussion of such matters as they may deem proper, in connection with date of holding fairs, and other matters of mutual interest for the success of the Omaha and Nebraska state fairs, and that your Board appoint a committee to confer with the aforesaid committee on this subject.

DANIEL H. WHEELER,
Secretary.

On motion, 3 o'clock to-morrow be fixed as the hour for election of officers.

On motion, adjourned to meet at this place to-morrow morning, at 9 o'clock.

SECOND DAY.

MORNING SESSION.

LINCOLN, Jan. 19, 1887.

Presence of officers and members as yesterday.

Secretary presented papers in case of Thos. A. Stratton, competitor for Arbor Day premium 1886. Referred to committee consisting of W. W. Watson, Jefferson county; W. N. Paton, Nance county; C. Hartman, Douglas county.

The committee in due time reported that Mr. Stratton was the only competitor, and that he had planted, in compliance with requirements, on Arbor Day, 1886, 11,200 hardwood trees, the premium offered for same being \$25. On motion, and by order of the Board, Mr. Stratton was awarded first premium with first money, \$25, less the 20 per cent, as provided by rule of the Board.

The Secretary presented correspondence between Parlin, Orendorff & Martin and B. & M. R. R, in matter of claim for damages on the part of the former. Mr. Calvert reported he had compromised the claim by paying the sum of \$12.15, which he thought the State Board of Agriculture ought to pay.

On motion the claim was allowed and the Secretary directed to draw a warrant for the sum.

Mr. Dinsmore offered the following preamble and resolutions, which were unanimously adopted:

In the matter of the spread of contagious diseases:

WHEREAS, The Nebraska State Board of Agriculture, viewing with utmost concern the continued spread of contagious diseases of cattle, and realizing that an emergency now exists that admits of no delay; therefore

Resolved, That we approve the bill now before Congress, known as the Miller Bill.

Resolved, That we earnestly implore the Nebraska Senators and Representatives in Congress, to give their aid in bringing up said measure, and votes in favor of the passage of said bill.

Resolved, That the Nebraska Legislature be requested to memorialize Congress to this end.

Resolved, That a copy of these preamble and resolutions be furnished both branches of the Nebraska Legislature, and each Senator and member of Congress from this state.

As to agricultural experiment stations:

WHEREAS, The Nebraska State Board of Agriculture has repeatedly expressed its interest in agricultural experiment stations, and does now entertain the liveliest and highest appreciation of the practical importance and urgent need of such institutions; therefore,

Resolved, That we heartily endorse the bill now before the congress of the United States for the establishment of at least one such experiment station in each of the several states and territories of the union.

Resolved, That we respectfully, but earnestly and urgently, solicit the efforts of the senators and representatives from Nebraska in aid of the early passage of this exceedingly important measure.

Resolved, That a copy of these resolutions be sent as soon as possible to each of the Nebraska members of Congress and to the committee on agriculture of each house.

As to new speed association:

Resolved, That the Nebraska State Board of Agriculture approve and hereby endorse the following resolution adopted by the International Association of Fairs and Expositions, at its late session held in the city of Chicago.

"Resolved, That the best interests and the fair conduct of speed trials all over the country require the formation of a new association for the regulation of the same independent of any like association now in existence. And that this Association, which includes premiums for speed in its catalogue, will heartily aid such movement."

Committee on Treasurer's report and financial portion of the Secretary's report made the following report, which was adopted:

Mr. President: We your committee appointed to examine reports of Secretary and Treasurer have performed our duty and would respectfully report that the amount of money received from all sources during the year 1886 was...\$42671.11

Total amount of warrants issued and paid in 1886.....\$33696.60

Warrant of 1885, paid..... 2.50

Total paid.....\$33699.10

Balance on hand.....\$ 8972.01

Warrant of 1886, not paid..... 54.15

All of which is respectfully submitted.

J. JENSEN.

R. H. HENRY.

JAS. W. EATON.

Dr. W. Hardy, of Colfax county, was asked to address the meeting on the subject of Hog Diseases, after which quite a prolonged discussion was indulged in by the members and which resulted in the appointment of the following committee:

J. J. Cafferty, of Holt county; O. M. Druse, of Lancaster county; H. D. Kelly, of Madison county.

This committee was instructed to confer with Dr. Hardy and all other parties claiming remedies for hog diseases, and obtain from them such remedies, and pay such compensation as in their judgment was right and proper.

The following resolution was introduced by W. W. Watson and unanimously adopted:

Resolved, That a committee of three be appointed to request the senate and house of representatives to memorialize the Congress of the United States to enact what is commonly known as the "Hatch Bill" on experimental agricultural stations.

W. W. Watson, of Jefferson county; L. A. Kent, of Kearney county; W. D. Wildman, of Red Willow county, were appointed said committee.

Prof. Chas. E. Bessey, Dean of the State Industrial College and State Botanist for the Board, submitted his annual report, and at the same time read a paper he had prepared on invitation, on the subject of Grasses.

A vote of thanks was extended Prof. Bessey for his paper and a copy solicited for publication.

[This paper will be found published in the Appendix.]

On motion Prof. Bessey was allowed the sum of \$50 to be used in the prosecution of his work as Botanist for the Board for the year 1887.

Prof. W. W. Wing, of the State Industrial College, on invitation, had prepared and now read a paper on "Experiments and Experiment Stations."

A vote of thanks was extended Prof. Wing and copy of his paper solicited for publication.

[The paper will be found published in the Appendix.]

Mr. Wheeler offered the following resolutions, which were unanimously adopted:

Resolved, That we have learned with great satisfaction of the valuable services of the U. S. Commissioner of Agriculture A. J. Coleman, in his sending scientific members of his staff of assistants to Nebraska and other western states to ascertain by personal and scientific observations the relative value of forage and other crops upon elevated and arid portions of our and other states similarly located.

Resolved, That we, as members of an organization representing the agricultural interests of Nebraska, return thanks for the valuable work commenced, and earnestly hope that the good work will be continued and the results be made known through the department publications, for the benefit of agriculturalists.

Resolved, That the Secretary be requested to furnish the Commissioner of Agriculture with a copy of these resolutions.

Mr. Furnas offered the following resolution, which was unanimously adopted:

Resolved, That this Board, cheerfully and without hesitation, recommend that U. S. Commissioner of Agriculture Coleman appoint, as state statistician for Nebraska, Eli A. Barnes, believing that such appointment would result greatly to the advantage of agriculture in the new west.

Mr. Wheeler presented the following:

To the State Board of Agriculture:

At a meeting, having this day been held, of the joint committees from the Omaha Fair and Exposition Association and the State Board of Agriculture, and after organization and a discussion of the matter, it was requested that the gentlemen rep-

representing the Omaha Fair Association present to the State Board a summary of dates for fairs in the west, including these two associations. Agreeably to request, the following is submitted for your consideration, viz:

Des Moines fair, Sept. 2-9; Omaha fair, Sept. 9-16; Lincoln fair, Sept. 16-23; Kansas City fair, Sept. 23-30; St. Louis fair, Oct. 3-8.

The above dates will accommodate all and would certainly be of mutual benefit to all in the circuit.

Respectfully,

C. PARKER,

T. MOUNT,

H. G. CLARKE,

D. H. WHEELER,

For the Omaha Fair Association.

This communication, being considered as a report from the conference committee on that subject, was freely and in good spirit discussed. The Board, by unanimous vote, decided it could not entertain a proposition to change the dates fixed for the fair of 1887, viz., September 9 to 16, inclusive, that date having been agreed upon at the semi-annual meeting in September, 1886, and again by the District Fair Circuit Association held at Chicago last fall.

Adjourned to meet at 2 o'clock this afternoon.

SECOND DAY.

AFTERNOON SESSION.

JANUARY 19, 1887.

Attendance of officers and members as before.

Mr. Eaton offered the following resolutions, which were adopted:

Resolved, That the Board of Managers be instructed to erect suitable accommodations for spectators at the show ring for cattle, furnishing comfortable seats and shelter for at least 300 people.

Resolved, That the Board of Managers be instructed to provide suitable show yards for swine.

Resolved, That this Board adopt the one expert plan for judging swine of all classes, and that the Committee on Premium List be instructed to remodel the list of premiums on swine, on a scale commensurate with this great interest, and abreast with the more advanced fairs in other states.

Mr. Eiche offered the following resolution, which was adopted:

Resolved, That Chas. E. Bessey, R. W. Furnas, and J. D. Krautch be appointed a committee to draft a memorial to the Legislature relative to the importance of the subject of forestry, both as to planting and preservation of forests.

Mr. Dinsmore offered the following resolutions, which were adopted:

Resolved, That the State Board of Agriculture appoint a committee to present a bill to the present Legislature, for the appropriation of funds to build a suitable Veterinary School in connection with the Industrial College of the State University.

Resolved, That it is the meaning of the State Board of Agriculture, that the state should give the University such additional assistance as is necessary to carry on the work of investigating into the best means of preventing swine-plague and other animal diseases.

W. W. Watson, Jefferson county; L. A. Kent, Kearney county, and W. D. Wildman, Red Willow county, were appointed said committee.

The Committee on Nominations submitted the following report of names to fill vacancies on the Board, which was adopted:

REPORT OF COMMITTEE ON NOMINATIONS.

LINCOLN, January 18, 1887.

Nebraska State Board of Agriculture:

GENTLEMEN—Your Committee on Nominations for new members beg leave to report the following names for your consideration and recommend that they be elected as members:

No. 1.	R. W. Furnas	Nemaha county.
" 2.	F. H. Holt.....	Gage "
" 3.	E. A. Barnes.....	Hall "
" 4.	M. Dunham.....	Douglas "
" 5.	E. M. Grennell.....	Washington "
" 6.	J. B. Dinsmore.....	Clay "
" 7.	J. Jensen.....	Fillmore "
" 8.	R. H. Henry.....	Platte "
" 9.	J. S. Hughes.....	Hayes "
" 10.	W. H. Barstow.....	Hamilton "
" 11.	R. W. Blake.....	Brown "
" 12.	A. Humphrey.....	Lancaster "
" 13.	A. W. Buffen.....	Johnson "
" 14.	W. H. Smith.....	Saline "

Yours respectfully,

J. E. NORTH,
Chairman.

GEO. F. WARREN.
R. R. GREER.
S. H. WEBSTER.
J. D. MACFARLAND.

On motion Ed. McIntyre, of Seward county; A. Humphrey, of Lancaster county; G. F. Warren, of Clay county; L. A. Kent, of Kearney county, were appointed as a joint committee to act with a like committee from the State Horticultural Society in the matter of needed legislation for both organizations.

[The committee from Horticultural Society was Carpenter, Griffey, and Emery.]

The Secretary was instructed to draw a warrant for Mr. Small on his broom corn exhibit at last state fair, first premium and first money, \$60, less the usual per cent.

Mr. Dunham offered the following resolution, which was adopted:

Resolved, That the Secretary be authorized to purchase a desk for use in his office, not to exceed in cost the sum of \$125.

Mr. Dinsmore offered the following resolution, which was adopted:

Resolved, That this Board recommend the appointment of O. M. Druse as a member of the Live Stock Sanitary Commission of the state.

The hour fixed for election of officers, the order was proceeded with and resulted as follows:

S. M. BARKER, Merrick county, President.

J. B. McDOWELL, Jefferson county, First Vice-President.

R. R. GREER, Buffalo county, Second Vice-President.

L. A. KENT, Kearney county, Treasurer.

R. W. FURNAS, Nemaha county, Secretary.

The Board of Managers were empowered to appoint all the appointed officers.

On motion it was ordered that the Secretary, in publishing the list of county societies in this state, publish only such as are recognized by this Board; all others under a separate head for information.

It appearing that the Board of Managers, during the year 1886, had expended more money for improvements on the fair grounds than was authorized by the State Board at its annual meeting in January of that year, and good and sufficient reasons being given therefor, the State Board at this meeting approved and ratified such expenditure by the Board of Managers.

President Barker appointed the following Board of Managers for 1887, which were approved by vote of the Board:

Ed. McIntyre, chairman, of Seward county; J. B. Dinsmore, of Clay county; M. Dunham, of Douglas county; H. B. Nicodemus, of Dodge county; E. N. Grennell, of Washington county.

Chancellor Manatt, of the State University, being called on, delivered an interesting and appropriate extemporaneous address on the relations existing between the State Board of Agriculture and the ag-

ricultural college of the University, for which a vote of thanks was extended him.

The committee on premium list, which President Barker, *ad interim*, had appointed, reported progress, showing the changes and additions they proposed. The action by the committee was approved and they continued to complete their work and report to the Board of Managers for their approval.

It was, on motion of Mr. Dinsmore, ordered that the Board of Managers increase the size of the present poultry house to twice its present capacity.

On motion of Mr. McIntyre, the Board of Managers was authorized in their discretion to expend not to exceed the sum of \$1,500 in extending and increasing the accommodations of the present amphitheater to the race track.

On motion it was ordered that the Secretary draw warrants to pay the hotel bills of attending members, if need be, including breakfast to-morrow morning.

On motion the sum of \$5,000 was set aside for speed purposes, to be apportioned by the Board of Managers, and the sum of \$1,000 to be paid the Board of Managers for the year 1887.

Dr. Billings was requested to furnish a copy of his paper, not read, for publication, and a vote of thanks tendered him for its preparation.

[It will be found in the Appendix.]

The committee to report on the President's address and Secretary's report not having reported at the hour of adjournment, it was ordered that the Secretary be empowered to receive such report when made.

The same as to the committee to confer with parties having hog disease remedies.

Adjourned *sine die*.

The Board of Managers were authorized, in their discretion, to improve or enlarge the Fish Exhibit building, by removing the present office outside the present building.

CROP

AND OTHER

AGRICULTURAL PRODUCTS REPORT

FOR THE YEAR 1886.

COUNTY	LANDS			CORN		WHEAT		OATS	
	Acres Impv	Acres Unimp	Farms	Acres	Bushels	Acres	Bushels	Acres	Bushels
Adams.....	207572	108173	2148	68181	2044430	85658	718160	28508	705080
Antelope.....	70867	22890	2448	89865	1190960	6826	126620	9657	807995
Boone.....	71289	258863	1550	85292	1411890	18208	26406	13988	579620
Buffalo.....	182585	268178	2422	70484	2466940	82561	227857	26386	923475
Butler.....	170486	176841	2356	74422	3604770	22755	841525	18066	722320
Burt.....	132689	168090	1556	90109	3604360	16772	201264	16741	787040
Brown.....	26572	66916	1701	3282	129240	1448	28960	8073	158650
Cass.....	276948	53427	2675	97087	3589480	15645	812900	12809	640450
Cedar.....	51542	385129	795	16896	675840	8763	56445	7068	818960
Chase.....	.....	16099	92	.....	.....	.....	.....	.....	.....
Cherry.....	980	21214	875	3002	75080	1421	21815	2528	52460
Cheyenne.....	22852	105	105	247	8880	.....	.....	.....	.....
Clay.....	224268	112827	2506	95532	2869280	50801	1016020	23640	1182000
Colfax.....	98009	129875	1508	51751	2070040	18652	573040	15696	478850
Cuming.....	107033	191582	1645	64489	1488349	24878	823414	14864	480920
Custer.....	46609	231746	3868	12592	503680	6652	133040	3529	105870
Dakota.....	27204	222528	725	13107	196056	6661	99960	2171	130260
Dawes.....	.....	703	82	.....	8280	.....	.....	.....	.....
Dawson.....	53992	267080	1590	7309	298360	4108	82120	3595	117850
Dixon.....	52987	211949	1050	50361	2018040	9223	158545	30406	1824360
Dodge.....	145540	146830	2008	100241	3007210	80100	801000	41802	1445570
Douglas.....	103137	99408	1521	24888	996520	1095	21900	6046	181590
Dundy.....	968	29032	532	238	9520	.....	.....	85	1060
Fillmore.....	283388	111920	2642	98555	2965650	35363	966993	22767	1138950
Franklin.....	67059	227806	1384	23111	924440	19348	199480	4063	101575
Frontier.....	450	154189	1546	4386	109660	2110	42200	1302	65100
Furnas.....	60786	284060	1506	81433	3267320	15924	159240	8285	330400
Gage.....	283938	215711	8540	151241	49640	20164	408280	32592	1313680
Garfield.....	.....	.....	839	.....	.....	.....	.....	.....	.....
Gosper.....	23801	130497	990	15117	604680	7578	151620	2446	73380
Greeley.....	34310	178268	759	19801	7922040	12675	190125	13500	607500
Hall.....	188408	105765	1630	50414	1512420	25708	385590	24318	808955
Hamilton.....	211747	99799	2427	56226	2249040	86456	1722800	13517	799020
Harlan.....	92511	185022	1415	33100	1324000	42050	462550	1986	58060
Hayes.....	1786	17251	305	8312	249360	2510	12750	1309	52680
Hitchcock.....	15408	1266	6084	21340	2230	46060	2582	51680	.....
Holt.....	62087	216439	4240	23640	94560	4260	85400	8900	415000
Howard.....	81555	202987	1351	93485	2804550	50827	457443	19876	656725
Jefferson.....	132052	212005	1941	71152	2846090	11564	231280	12506	625800
Johnson.....	116807	111296	1626	65845	2963025	7170	71700	10233	409320
Kearney.....	119690	187490	1624	170862	681460	37852	378520	70888	2481080
Keith.....	269	6885	377	1476	50440	195	8900	578	23120
Keya Paha.....	10547	25571	1604	1285	49400	341	6526	471	18840
Knox.....	35007	296702	1558	22290	780150	6790	13590	10470	52350
Lancaster.....	277737	205838	8973	137908	417240	12837	264740	24946	873110
Lincoln.....	24218	77413	772	12318	369540	3965	79900	5515	220600
Logan.....	9076	.....	171	15861	384025	1165	20970	2245	58625
Loup.....	3093	7710	275	1207	48280	484	9590	590	29600
Madison.....	72686	222425	1547	49204	1768160	31122	622440	15248	579424
Merrick.....	11577	145182	1173	45818	1812720	10325	206500	20316	812640
Nance.....	71546	209621	769	14822	592850	4039	81780	3712	148480
Nemaha.....	194896	46299	1918	63895	235800	9928	198560	7789	311670
Nuckolls.....	105477	232803	1438	54908	1644240	7716	77160	7448	297720
Otoe.....	317157	55978	2611	109800	3294000	16791	318520	13717	411610
Pawnee.....	390142	164980	1718	30616	918480	5486	109720	12416	372480
Phelps.....	90070	151839	1327	36260	1340400	84680	69960	9840	399800
Pierce.....	31518	228756	755	15402	616080	20625	412520	1840	123600
Platte.....	132671	244690	2086	58365	2918250	17429	348580	21817	1090850
Polk.....	167060	71542	1825	61282	2451280	16793	167930	19580	763200
Red Willow.....	166967	123205	1270	7727	309080	9491	49940	7710	306400
Richardson.....	272679	53063	2760	94640	2839200	12760	255200	9545	395800
Saline.....	238525	123350	2881	116140	384200	26293	525760	10112	844480
Sarpy.....	30158	52776	1030	42872	1704880	2850	57000	20046	401350
Stonx.....	799	.....	99	.....	.....	.....	.....	.....	.....
Saunders.....	392155	61292	8642	30640	122920	120514	2110280	602	20080
Seward.....	318473	29589	2584	77058	3082320	19077	371440	16319	612760
Sheridan.....	4449	18944	1130	3483	80460	2425	48500	3741	112230
Sherman.....	46209	184838	1126	25405	762150	20562	41040	4413	152590
Stanton.....	33599	225677	595	16309	489270	5065	10122	4844	148920
Thayer.....	109845	233216	1555	58696	1750880	11708	117080	9568	267040
Valley.....	39491	189447	1195	17995	359900	1720	3440	4735	142050
Washington.....	174908	57450	1630	41876	1047900	9765	136710	6983	279820
Wayne.....	5336	241320	630	.....	.....	.....	.....	.....	.....
Webster.....	124761	180817	1647	38417	1152510	10422	308440	6092	152760
Wheeler.....	3461	28636	874	6744	246040	492	9840	2672	158600
York.....	246150	96415	2994	102099	3062970	36166	361660	29968	449870
Total.....	7810089	9974481	119987	3303343	104314744	1097150	17521784	840014	32191454

COUNTY	BARLEY		RYE		FLAX		MILLET		BROOM CORN	
	Acres	Bushels	Acres	Bushels	Acres	Bushels	Acres	Tons	Acres	Tons
Adams.....	10820	361200	30	600	763	.....	.....	.....	410	880
Antelope.....	748	18700	1936	24848	264	1848	.....	.....	132	264
Boone.....	684	28940	571	11420	2751	27510	150	450	.....	.....
Buffalo.....	2132	31980	965	12545	1524	12192	1536	3072	60	15
Butler.....	762	20584	1149	29943	9173	91730	708	2824	102	102
Burt.....	426	10650	930	18600	503	5030	511	1533	50	125
Brown.....	102	3570	27	540	5	50	.....	.....	44	88
Cass.....	3698	129430	685	13700	15	150	1321	3963	110	220
Cedar.....	1004	35140	565	14125	2592	20736	241	482	.....	.....
Chase.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Cherry.....	24	840	542	8130	.....	.....	224	448	.....	.....
Cheyenne.....	14483	431490	.....	.....	.....	.....	.....	.....	.....	.....
Clay.....	462	16170	3487	69740	7658	76580	.....	.....	385	770
Colfax.....	274	9590	.....	.....	.....	.....	.....	.....	.....	.....
Cuming.....	506	20240	443	8860	918	9180	.....	.....	11	22
Custer.....	286	8580	1425	28500	510	10200	1342	4026	516	1548
Dakota.....	286	8580	.....	.....	.....	.....	.....	.....	.....	.....
Dawes.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Dawson.....	1622	56770	1410	28200	.....	.....	.....	.....	83	246
Dixon.....	1313	32825	542	8130	.....	.....	207	1035	49	98
Dodge.....	2625	62500	.....	.....	3024	30240	525	1020	110	220
Douglas.....	1212	48480	285	5700	.....	.....	1115	2230	.....	.....
Dundy.....	12	420	79	1580	.....	.....	.....	.....	.....	.....
Fillmore.....	7841	235230	537	10740	545	5450	251	753	55	110
Franklin.....	1344	38600	1519	15190	48	480	1361	1814	135	270
Frontier.....	266	5320	304	9240	36	360	640	1280	99	198
Furnas.....	4328	86960	5332	53320	.....	.....	2522	5044	802	1604
Gage.....	6393	287685	8357	250710	15019	150190	15811	30622	503	201
Garfield.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Gosper.....	438	15330	.....	.....	.....	.....	.....	.....	330	660
Greeley.....	407	16280	321	9630	540	5400	1160	3480	.....	.....
Hall.....	10201	204020	3188	47720	.....	.....	275	875	22	44
Hamilton.....	4979	15987	106	212	27206	215648	75	150	.....	.....
Harlan.....	1670	4175	3700	74000	150	1500	2407	4814	110	220
Hayes.....	.....	.....	500	12500	110	1320	503	1006	.....	.....
Hitchcock.....	287	8610	1425	28500	20	200	2918	5836	.....	.....
Holmes.....	5642	169260	.....	.....	11984	119840	11308	22616	.....	.....
Howard.....	4968	124200	546	8190	21	210	509	1013	.....	.....
Jefferson.....	569	1707	1380	13800	908	9080	1156	2312	.....	.....
Johnson.....	675	20250	1612	16120	30243	272187	2006	4012	33	66
Kearney.....	3181	95480	904	27120	123	1353	207	414	240	480
Keith.....	3	90	.....	.....	.....	.....	.....	.....	.....	.....
Keya Paha.....	41	120	.....	.....	.....	.....	.....	.....	.....	.....
Knox.....	800	16000	.....	.....	885	8850	203	406	.....	.....
Lancaster.....	592	23680	6059	121180	957	7656	5140	20560	151	453
Lincoln.....	1654	66160	.....	.....	.....	.....	5582	11164	.....	.....
Logan.....	.....	.....	142	2130	.....	.....	216	432	.....	.....
Loup.....	67	2010	32	640	.....	.....	.....	.....	.....	.....
Madison.....	2400	67200	7484	149680	230	1610	1500	3750	154	308
Merrick.....	1819	54570	.....	.....	442	4420	1514	3028	132	264
Nance.....	552	12144	292	5840	138	1380	.....	.....	.....	.....
Nemaha.....	1341	28302	967	19340	.....	.....	.....	.....	44	88
Nuckolls.....	2340	7020	654	11772	80	800	1516	3032	110	220
Otoe.....	9386	234650	4753	95060	125	1250	516	1032	112	224
Pawnee.....	1324	33100	3640	91000	.....	.....	6402	19206	20	10
Phelps.....	1380	4140	1070	21400	800	8000	.....	.....	1312	2624
Pierce.....	885	22125	1504	30080	1316	15792	706	1412	.....	.....
Platte.....	2763	82890	614	12280	1100	8800	316	948	150	225
Polk.....	1173	11730	1818	36360	1223	11007	1425	2850	600	200
Red Willow.....	168	5040	180	2700	.....	.....	.....	.....	220	440
Richardson.....	1588	56790	2025	30375	.....	.....	500	1500	.....	.....
Saline.....	2945	88350	1287	16731	650	3450	1521	3042	.....	.....
Sarpy.....	782	21960	1044	13572	10	90	621	1242	4	36
Sioux.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Saunders.....	2536	76090	.....	.....	.....	.....	.....	.....	225	550
Seward.....	1687	33540	295	4375	1491	14910	619	1238	33	66
Sheridan.....	2307	44140	240	3600	525	5250	1302	2604	.....	.....
Sherman.....	307	6140	.....	.....	.....	.....	.....	.....	.....	.....
Stanton.....	496	992	31	315	.....	.....	.....	.....	.....	.....
Thayer.....	1985	39700	668	10020	.....	.....	332	664	22	44
Valley.....	290	8700	185	3700	.....	.....	.....	.....	.....	.....
Washington.....	2124	42480	.....	.....	600	4800	.....	.....	.....	.....
Wayne.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Webster.....	1909	19090	2078	37564	.....	.....	1024	1050	2300	4600
Wheeler.....	180	4500	246	738	150	1500	200	600	.....	.....
York.....	3847	76940	3117	62340	17310	173100	1260	3780	480	160
Total.....	147966	3840966	35191	1651587	144685	1341329	82304	19069	10490	18963

COUNTY	POTATOES		HORSES	CATTLE	MULES & ASSES	SHEEP	HOGS	No. of fruit trees	No. of Forest Trees	No. of Grape Vines.
	Acres	Bushels								
Adams.....	315	18900	6402	15602	1006	845	16160	73384	1806155	15114
Antelope.....	575	39500	5223	12782	426	2181	15031	22740	4068590	3934
Boone.....	1425	85500	4328	12657	306	1560	21441	6542	256810	929
Buffalo.....	355	71000	7876	23908	660	4285	35252	41061	789876	3894
Butler.....	806	120900	7486	20173	570	753	16610	50332	1272707	10151
Burt.....	572	28600	6047	24844	738	8337	25369	61198	1802341	12225
Brown.....	1450	87000	3195	8236	261	2044	2684	1195	45478	451
Cass.....	542	81300	10328	27887	1110	307	33054	151040	1295132	53740
Cedar.....	.....	.....	2438	16863	172	2613	9555	5651	785898	965
Chase.....	.....	.....	848	2305	138	8	97	.....	.....	.....
Cherry.....	1688	1266004	2140	13531	158	2435	858	.....	.....	.....
Cheyenne.....	.....	.....	4284	38894	195	9419	308	.....	.....	.....
Clay.....	893	55380	8199	17298	796	5812	22081	10860	29-9782	.....
Colfax.....	903	72180	4484	14964	395	1852	9089	.....	.....	.....
Cuming.....	910	72600	6003	19863	569	5763	16165	33576	1941550	8566
Custer.....	1225	245000	9997	23015	903	16877	22423	13520	204247	1678
Dakota.....	214	21400	25525	13476	407	45	7747	7575	.....	897
Dawes.....	.....	.....	2640	7781	430	1308	467	.....	.....	.....
Dawson.....	710	42600	5530	14679	358	19403	8737	18074	584615	3520
Dixon.....	1682	168200	3820	15234	178	645	10839	.....	.....	.....
Dodge.....	3314	994200	6752	20946	587	746	1732	40200	1 0031	20600
Douglas.....	75	4500	7840	16711	864	1395	12564	168267	6504075	18526
Dundy.....	22	1320	976	6865	130	1738	841	600	3156	220
Fillmore.....	1412	84720	8336	18426	703	3247	19672	124210	4466974	20355
Franklin.....	334	34736	3806	10162	367	5389	18864	23493	985959	4308
Frontier.....	665	99750	4276	10720	408	3833	2007	.....	1216400	.....
Furnas.....	1200	288000	5453	13469	2-3	11065	11173	24725	1565710	4245
Gage.....	2421	.....	12769	33598	1116	18074	277-6	163189	1534785	96000
Garfield.....	.....	.....	719	3235	60	586	1372	.....	.....	.....
Gosper.....	386	23160	2438	5326	154	2495	6407	8424	797560	1676
Greeley.....	3214	482100	076	7243	307	2178	7351	25000	1270000	20240
Hall.....	460	115000	6026	21746	793	9613	13852	40706	1683604	9896
Hamilton.....	100	4000	7102	15529	750	1075	19460	58924	2710120	13474
Harlan.....	1650	49500	3877	10444	373	4629	10463	9811	5624	25
Hayes.....	5-2	52 00	1193	4276	70	1172	465	.....	.....	.....
Hitchcock.....	710	71000	2069	4664	245	2538	1170	5380	159651	2510
Holt.....	.....	.....	7491	26891	714	9406	11979	10453	5002812	22424
Howard.....	224	33600	3732	10937	503	3195	13370	19752	1827016	16752
Jefferson.....	.....	.....	6729	20415	677	12678	21922	77310	943372	22490
Johnson.....	514	61680	5880	17225	613	2336	19598	114340	2849399	27487
Kearney.....	965	96500	4544	7781	547	7344	21132	50790	1624574	5309
Keith.....	.....	.....	2159	14007	311	130	591	428	14465	309
Keya Paha.....	.....	.....	2198	6427	239	808	2581	6463	3435	1068
Knox.....	.....	.....	3975	13636	321	3181	12066	14790	3416	10004
Lancaster.....	1992	298800	13371	37144	1179	6199	36166	166910	3355711	39180
Lincoln.....	.....	.....	4213	15185	163	7899	1063	.....	.....	.....
Logan.....	565	113000	818	1099	41	1443	272	2300	500618	1642
Loup.....	.....	.....	661	1698	94	653	1696	4009	24205	86
Madison.....	104	7280	5011	1438	288	1978	15172	14227	6190204	12312
Merrick.....	550	33000	4541	20162	434	12684	11127	.....	.....	.....
Nance.....	328	32800	2092	8093	246	771	11159	8789	269898	6784
Nemaha.....	390	39000	6576	22030	874	1077	28383	160368	2180021	26252
Nuckolls.....	319	27950	5205	19545	613	6884	22388	50615	2614575	9364
Otoe.....	420	2100	9200	31780	1450	3435	27761	219278	1489600	61411
Pawnee.....	665	9875	6187	25267	354	6448	15114	400600	15406	100316
Phelps.....	576	34560	4005	8760	426	1457	16396	21465	2425700	1350
Pierce.....	140	5600	2170	7860	194	2192	7847	.....	.....	.....
Platt.....	2100	84000	6831	23535	375	3118	25017	22873	2498612	5478
Polk.....	104	3640	6283	14532	494	3109	24002	38929	2818062	5420
Red Willow.....	673	40380	3735	11579	255	5231	4779	6446	90326	871
Richardson.....	408	204000	9491	25780	1851	1925	36049	289405	13862852	640
Saline.....	18	1800	10336	27803	742	2955	37290	131190	2260313	24043
Sarpy.....	584	35040	4224	17906	314	104	11480	5892	160318	7020
Sioux.....	.....	.....	733	12983	5	1087	4	.....	.....	.....
Saunders.....	1480	88800	11420	31511	174	2956	36123	115416	550300	20616
Seward.....	1003	60180	8378	23172	857	22051	27175	66924	3858900	20752
Sheridan.....	4016	40160	2095	4360	349	546	491	22	83	.....
Sherman.....	350	21000	2737	6263	253	3668	10145	25416	1216819	10424
Stanton.....	.....	.....	2237	9868	16	6177	7256	4276	6981400	286
Thayer.....	21	3150	5473	14046	626	8070	16100	27189	358651	4405
Valley.....	120	6000	3164	11318	246	2610	8195	15592	1576616	3125
Washington.....	5780	326800	5690	22250	870	886	21704	46734	780311	.....
Wayne.....	277	16620	2828	10160	3-9	3285	8954	.....	.....	.....
Webster.....	1604	80300	5729	15498	606	8719	22268	30837	1473676	4512
Wheeler.....	324	64800	1102	5301	94	1313	1799	3821	2967350	1147
York.....	2413	241300	9132	20437	837	1933	28443	192722	1845234	2698
Total.....	59777	6933965	404878	1173929	36819	323146	1054153	3605808	1875156	807091

APPENDIX.

NEBRASKA WEATHER SERVICE FOR THE YEAR 1886.

BY GOODWIN D. SWEZEY,

Director Boswell Observatory, Doane College, Crete, Nebraska.

JANUARY.

The month opened with a storm of considerable energy in Texas, which moved in a north-easterly direction, accompanied by heavy snow in this region. This storm was very widespread and disappeared in the St. Lawrence Valley on the 4th.

The severest storm of the month developed in western Kansas during the afternoon of the 6th. At the time of its formation a cold wave made its appearance north of Montana. The storm at first was a weak depression, and was pressed southward by the area of high pressure till it reached the Texas coast on the 7th. Cold wave flags were ordered up in eastern Nebraska on the afternoon of the 6th; this was a genuine "norther," wind blowing that night from the NNW at from forty to fifty miles an hour at Crete; the temperature fell thirty-nine degrees in twenty-four hours. The cold wave moved with great rapidity southward, causing a severe "norther" in Texas, with intense cold weather, which was destructive to animal life and the sugar-cane in the sugar-growing regions of Texas and Louisiana. The storm, continuing its northeasterly movement, was central over the Chesapeake Bay at midnight of the 8th, and was last observed on the 10th over the Gulf of St. Lawrence. The lowest temperature of the month was on the 8th during the passage of the cold wave. On the 14th another storm made its appearance in Texas, moved north-eastwardly to the lake region, and was followed by a cold wave, for which flags were ordered up here and which were justified by a fall of twenty-two degrees. The next considerable storm was on the 18th; it was also followed by a cold wave. On the 22d a cold wave made its appearance in the north-west and gradually overspread all districts; and a fourth cold wave with a fall of thirty-one degrees came on the last day of the month.

On the whole the month has been a marked month with the most continued cold weather for many years ; the cold has not been extreme, the minimum for the month not being as low as for the past three Januaries, but the mean temperature for the month, as will be seen from the table below, has been far lower than ever before since our observations began. In the middle and western sections of the state, as will be seen from the reports below, the temperature has been considerably higher and on the Pacific coast it was about as high as usual. The month has also been most remarkable in the amount of snow, being nearly double that of any preceding January, as seen from the table; and nearly four times the normal amount for January. The number of days of snow fall and the number of cloudy days have been correspondingly large.

COMPARISON OF PAST JANUARIES.

The table shows the mean temperature, the noon temperature, and the number of days below zero for the past nine Januaries in southeastern Nebraska ; they are found by averaging the numbers reported at the different stations. It also shows the highest temperature and the lowest recorded anywhere in the state by standard, self-registering thermometers :

Jan.	Mean Temp.	Noon Temp.	Below Zero.	Highest Temp.	Lowest Temp.
1878	26.9	46.8	—	—	—
1879	18.5	29.9	10.1	—	—
1880	33.4	42.8	0.	—	—
1881	12.8	17.2	10.7	42.0	-32
1882	24.5	32.5	1.7	50.0	- 1
1883	11.8	22.3	—	50.3	-28
1884	17.2	25.4	—	48.8	-32
1885	12.3	20.0	16.2	56.8	-26.8
1886	6.8	13.3	11.4	52.0	-24.8

The following table shows the precipitation or depth in inches of rain and melted snow or hail, the number of days on which it fell, and the number of cloudy and of clear days. Days are counted cloudy when the sky is four-fifths overcast ; clear when less than one third. The last column shows the depth in inches of unmelted snow which fell during the month:

Jan.	Precipitation.	Days of Precip.	Cloudy Days.	Clear Days.	Snow Fall.
1878	0.86	2.0	4.0	18.0	—
1879	0.66	2.1	3.8	17.4	3.1
1880	0.54	1.8	3.8	16.9	2.6
1881	1.31	5.6	6.1	10.9	6.6
1882	0.56	3.9	6.2	12.8	3.5
1883	1.09	6.7	4.3	11.7	9.7
1884	0.68	—	—	—	—
1885	0.57	4.5	5.5	13.0	3.7
1886	2.04	9.1	1.0	9.9	18.8

PRECIPITATION.

The average rain for the different sections of the state for January, 1886, is as follows :

	Inches
N. E. Section (one station).....	0.44
North Middle (no station).....	—
West (one station).....	0.55
South Middle (two stations).....	0.70
S. E. (covering essentially what has heretofore been the "whole state" as far as reporting).....	2.04
State average by sections.....	0.93

TEMPERATURES AND PRECIPITATIONS.

Temperatures printed in *italics* are noon temperatures ; all others are means.

SOUTH-EAST SECTION.

STATION.	OBSERVER.	TEMP.	PREC.
Crete,	G. D. Swezey,	6.1	1.63
Omaha,	A. Pollock,	7.3	1.15
Ashland,	Geo. Shedd,	<i>10.7</i>	2.00
Beaver Creek,	E. Smith,	—	—
Dawson,	M. L. Libbee,	10.8	—
De Soto,	Chas. Seltz,	7.0	2.24
De Witt,	F. C. Ware,	<i>14.1</i>	2.00
Fairbury,	Dr. Humphrey,	<i>17.9</i>	2.90
Falls City,	Jennie Keim,	—	—
Fremont,	I. E. Heaton,	6.5	2.17
"	"	9.7	—
Harvard,	M. F. Wistrom,	—	—
Lincoln,	H. H. Wing,	7.2	—
Marquette,	J. Ellis,	<i>14.9</i>	1.90
Minden,	Joel Hull,	—	—
Mission Creek,	M. K. Walker,	6.3	1.87
Nebraska City,	J. B. Parmalee,	6.7	1.20

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STATION.	OBSERVER.	TEMP.	PREC.
Stockham,	J. W. Gray,	15.8	3.60
Stromsburg,	S. S. Kauffman,	6.0	1.86
Syracuse,	P. W. Risser,	8.3	0.90
Weeping Water,	G. Treat,	6.1	2.05
West Hill,	J. L. Truman,	3.0	1.13
York,	D. P. Nicholson,	12.2	—
NORTH-EAST SECTION.			
Neligh,	H. C. Huxford,	8.2	0.44
West Point,	E. G. Bruner,	—	—
SOUTH MIDDLE.			
North Platte,	J. Fitzgerald,	15.9	0.09
Ogallala,	Dr. L. M. Line,	12.8	—
Red Willow,	Mrs. R. Buck,	—	1.29
Sargent,	S. W. Perin,	—	—
WEST SECTION.			
Hay Springs,	Wm. Waterman,	10.4	0.55

FEBRUARY.

COLD WAVES AND STORMS.

Five cold waves, the first a severe one, have been experienced during the month; the first brought the lowest temperature of the month on the 4th; the others came on the 10th, 15th, 20th, and 25th; they were all predicted in good time by the signal office at Washington and cold wave flags displayed at the central office, at Omaha, at Lincoln, and at Stromsburg. At this station the signal was hoisted from fourteen to thirty-four hours before the lowest temperature. No severe storms have occurred in the state.

WEATHER.

On the whole the weather has been about normal for February, except that the highest temperatures for the month have been higher than usual. The mean temperature—for the south-east section—has been slightly above the normal, and the precipitation somewhat deficient. In the western part of the state, however, and especially in the central, it has been much warmer than usual.

One hail storm, a very unusual feature for February, is reported from West Hill. Thunder storms, not usually so rare, have not been reported from any station, although distant lightning was seen by observers at Crete and Weeping Water.

WIND.

The highest wind velocity reported was at the central station, 42 miles per hour on the 24th; the average velocity was as follows:

Omaha.....	8.9 miles per hour.
North Platte.....	8.1 " " "

PRECIPITATION.

The average rain for the different sections of the state for February, 1886, is as follows:

	Inches
N. E. Section (two stations).....	0.58
North Middle (no station).....	—
West (one station).....	0.93
South Middle (two stations).....	0.50
S. E. (covering essentially what has heretofore been the "whole state" as far as reporting.....	0.70
State average by sections.....	0.68

COMPARISON OF PAST FEBRUARIES.

The table shows the mean temperature, the noon temperature, and the number of days below zero for the past nine Februaries in southeastern Nebraska; they are found by averaging the numbers reported at the different stations. It also shows the highest temperature and the lowest recorded anywhere in the state by standard, self-registering thermometers:

Feb.	Mean Temp.	Noon Temp.	Below Zero.	Highest Temp.	Lowest Temp.
1878	35.6	44.3	—	—	—
1879	19.6	33.4	—	—	—
1880	30.1	40.8	1.2	—	—
1881	18.2	25.3	5.5	40.0	-23
1882	33.4	42.4	0.7	63.8	-7.5
1883	20.5	27.0	5.6	61.0	24.9
1884	18.5	27.9	9.0	57.2	-20
1885	15.9	23.0	10.9	57.0	-22.2
1886	25.3	32.9	3.8	64.3	-19.4

The following table shows the precipitation or depth in inches of rain and melted snow or hail, the number of days on which it fell, and the number of cloudy and of clear days. Days are counted cloudy when the sky is four-fifths overcast; clear when less than one-third. The last column shows the depth in inches of unmelted snow which fell during the month:

Feb.	Precipitation.	Days of Precip.	Cloudy Days.	Clear Days.	Snow Fall.
1878	0.19	1.2	5.7	11.0	0.9
1879	0.76	3.2	2.7	8.5	—
1880	0.14	1.6	0.9	18.1	0.8
1881	2.72	5.2	7.0	10.2	14.4
1882	0.82	2.9	4.0	17.8	6.4
1883	0.90	5.2	6.2	13.4	4.9
1884	0.78	5.2	7.2	8.9	7.1
1885	1.12	6.0	7.6	11.2	9.3
1886	0.70	4.2	3.8	16.1	5.5

Wild geese were seen flying north by various observers from the 16th to the 23d and wild ducks were seen during the last week of the month. Mirage was several times reported at Marquette, and halos were seen by several observers.

LOCAL REPORTS.

The following are the mean temperatures, noon temperatures, and precipitations reported by various observers :

SOUTH-EAST SECTION.

STATION	OBSERVER.	MEAN.	NOON.	PRE.
Crete,	C. E. Chadsey,	—	—	—
Omaha,	A. Pollock,	24.4	—	0.36
Ashland,	Geo. Shedd,	—	29.7	0.72
Beaver Creek,	E. Smith.	—	—	—
Dawson,	M. L. Libbee,	29.2	—	—
De Soto,	Chas. Seltz,	24.0	—	0.41
De Witt,	F. C. Ware,	—	30.9	1.60
Fairbury,	Dr. Humphrey,	—	36.0	0.95
Falls City,	Jennie Keim,	28.3	—	0.85
Fremont,	I. E. Heaton,	22.4	29.1	0.46
Harvard,	M. F. Wistrom,	—	—	—
Lincoln,	H. H. Wing,	25.9	—	—
Marquette,	J. Ellis,	—	32.8	0.69
Minden,	Joel Hull,	—	—	—
Mission Creek,	M. K. Walker,	25.0	35.0	0.56
Nebraska City,	J. B. Parmalee,	25.8	—	0.60
Stockham,	J. W. Gray,	—	39.1	0.75
Stromsburg,	S. S. Kauffman,	25.7	—	0.67
Syracuse,	P. W. Risser,	25.3	—	0.80
Weeping Water,	G. Treat,	23.3	—	0.25
West Hill,	J. L. Truman,	23.7	—	0.65
York,	D. P. Nicholson,	—	32.5	—

NORTH-EAST SECTION.

Neligh,	H. C. Huxford,	—	—	0.11
West Point,	E. G. Bruner,	—	38.6	1.05

SOUTH MIDDLE.

STATION.	OBSERVER.	MEAN.	NOON.	PRE.
North Platte,	J. Fitzgerald,	32.8	—	0.17
Ogallala,	Dr. L. M. Line,	32.8	—	—
Red Willow,	Mrs. R. Buck,	—	—	0.82
Sargent,	S. W. Perin,	—	—	—
WEST SECTION.				
Hay Springs,	Wm. Waterman,	29.2	—	0.93

MARCH.

The most striking feature of the month of March has been the unprecedented snow fall of 25.3 inches, the normal amount for March being 4.6 inches and the greatest heretofore recorded by this service being 12.1 inches in March of 1881; the greatest snow fall for any month was in February of 1881, when it reached 14.4 inches, a trifle more than half of what has fallen the past month. The precipitation, number of days of precipitation, and proportions of cloudy days have been correspondingly large.

The temperature has been about five degrees below the normal, being the coldest March, except that of 1881, for the past nine years.

WIND.

The average wind velocities for the month were as follows:

Omaha.....	7.3 miles per hour.
North Platte	8.4 " " "

PRECIPITATION.

The average rain for the different sections of the state for March, 1886, is as follows:

	Inches.
N. E. Section (two stations)	2.20
North Middle (one station)	1.88
West (one station)	1.51
South Middle (two stations)	0.98
S. E. (covering essentially what has heretofore been the "whole state" as far as reporting).....	0.70
State average by sections.....	1.45

COMPARISON OF PAST MARCHES.

The table shows the mean temperature, the noon temperature, and the number of days below zero for the past nine Marches in south-

eastern Nebraska; they are found by averaging the numbers reported at the different stations. It also shows the highest temperature and the lowest recorded anywhere in the state by standard, self-registering thermometers:

Mar.	Mean Temp.	Noon Temp.	Below Zero.	Highest Temp.	Lowest Temp.
1878	46.8	57.8	—	80.	22
1879	40.6	52.1	—	86.	1
1880	34.8	46.6	1.8	—	—
1881	29.2	37.5	0	51.	4
1882	40.2	49.2	0	77.3	4
1883	33.6	42.2	0.1	71.	3
1884	34.8	43.1	1.4	73.	-46
1885	35.7	45.8	0	70.2	7
1886	31.7	39.1	1.9	73.	-15

The following table shows the precipitation or depth in inches of rain and melted snow or hail, the number of days on which it fell and the number of cloudy and of clear days. Days are counted cloudy when the sky is four-fifths over-cast; clear when less than one-third. The last column shows the depth in inches of unmelted snow which fell during the month:

Mar.	Precipitation.	Days of Precip.	Cloudy Days.	Clear Days.	Snow Fall.
1878	1.64	4.3	5.4	13.8	3.8
1879	0.63	3.5	2.3	14.2	3.6
1880	0.49	2.6	2.2	16.3	4.7
1881	1.77	6.	6.6	12.6	12.1
1882	0.26	2.3	2.6	15.8	3.0
1883	0.59	4.6	9.7	11.8	5.2
1884	2.36	8.7	10.6	7.	2.4
1885	0.28	3.1	2.6	17.5	2.2
1886	2.75	8.5	11.9	9.6	25.3

LOCAL REPORTS.

The following are the mean temperatures, noon temperatures, and precipitations reported by various observers:

SOUTH-EAST SECTION.

STATION.	OBSERVER.	MEAN.	NOON.	PRE.
Crete,	C. E. Chadsey,	30.9	—	2.39
Omaha,	A. Pollock,	31.0	—	1.31
Ashland,	Geo. Shedd,	—	33.0	3.33
Beaver Creek,	E. Smith,	—	37.5	3.16

STATION.	OBSERVER.	MEAN.	NOON.	RE.
Central City,	C. Shieldstream,	28.8	37.2	4.00
Dawson,	M. L. Libbee,	37.0	—	—
De Soto,	Chas. Seltz,	32.2	—	3.16
De Witt,	F. C. Ware,	—	39.0	1.80
Fairbury,	Dr. Humphrey,	—	42.0	2.56
Falls City,	Jennie Keim,	36.0	—	2.75
Fremont,	I. E. Heaton,	28.7	34.2	4.93
Harvard,	M. F. Wistrom,	—	—	—
Lincoln,	H. H. Wing,	—	—	—
Marquette,	J. Ellis,	—	37.9	3.52
Minden,	Joel Hull,	—	—	—
Mission Creek,	M. K. Walker,	32.5	41.7	2.16
Nebraska City,	J. B. Parmalee,	33.1	—	1.33
Stockham,	J. W. Gray,	—	44.8	2.00
Stromsburg,	S. S. Kauffman.	29.4	—	4.13
Syracuse,	P. W. Risser,	33.3	—	1.06
Weeping Water,	G. Treat,	29.0	—	2.62
West Hill,	J. L. Truman,	28.2	—	2.45
York,	D. P. Nicholson,	—	—	—

NORTH-EAST SECTION.

Neligh,	H. C. Huxford,	—	—	1.50
West Point,	E. G. Bruner,	—	34.0	2.50

NORTH MIDDLE.

Purdum,	T. C. Jackson,	28.6	—	1.88
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SOUTH MIDDLE.

North Platte,	J. Fitzgerald,	30.5	—	0.63
Ogallala,	Dr. L. M. Line,	29.2	—	—
Red Willow,	Mrs. R. Buck,	—	—	1.92
Sargent,	S. W. Perin,	—	—	—

WEST SECTION.

Hay Springs,	Wm. Waterman,	27.9	—	1.51
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APRIL.

Like the month of March, April was chiefly noteworthy for its unusual fall of snow. Temperature, precipitation, and nearly every other feature of the weather were nearly normal.

WIND.

The average wind velocities for the month were as follows:

Omaha.....	8.8 miles per hour.
North Platte.....	11.2 " " "
Crete.....	13.0 " " "

PRECIPITATION.

The average rain for the different sections of the state for April, 1886, is as follows :

	Inches.
N. E. Section (one station)	2.40
North Middle (one station)	3.25
West (one station)	1.83
South Middle (two stations)	2.56
S. E. (covering essentially what has heretofore been the "whole state" as far as reporting.....	2.78
State average by sections.....	2.59

COMPARISON OF PAST APRILS.

The table shows the mean temperature, the noon temperature, and the number of days below 32° for the past nine Aprils in south-eastern Nebraska ; they are found by averaging the numbers reported at the different stations. It also shows the highest temperature and the lowest recorded anywhere in the state by standard, self-registering thermometers :

April.	Mean Temp.	Noon Temp.	Below 32°	Highest Temp.	Lowest Temp.
1878	53.0	64.3	4.4	82	34
1879	52.0	61.1	5.5	80	13
1880	51.3	64.4	5.2	91	20
1881	45.1	54.0	9.8	81	6
1882	51.4	59.4	3.9	87	25
1883	52.3	60.4	3.2	95	29
1884	49.4	53.5	10.2	80.6	22
1885	49.2	58.2	4.8	84	19.8
1886	50.4	59.5	6.7	84.6	16.2

The following table shows the precipitation or depth in inches of rain and melted snow or hail, the number of days on which it fell and the number of cloudy and clear days. Days are counted cloudy when the sky is four-fifths overcast ; clear when less than one-third. The last column shows the number of thunder storms :

April.	Precipitation.	Days of Precip.	Cloudy Days.	Clear Days.	Thunder.
1878	2.42	6.2	6.4	5.2	3.6
1879	3.11	7.4	5.4	12.6	1.9
1880	0.82	2.3	2.6	17.0	1.6
1881	2.91	7.4	6.8	9.1	3.5
1882	4.80	7.3	9.2	8.7	3.9
1883	2.43	8.0	5.2	9.8	2.3
1884	2.91	7.4	10.0	7.5	2.8
1885	4.29	10.1	7.8	9.0	3.6
1886	2.78	9.7	7.7	9.7	3.5

LOCAL REPORTS.

The following are the mean temperatures, noon temperatures, and precipitations reported by various observers:

SOUTH-EAST SECTION.

STATION.	OBSERVER.	MEAN.	NOON.	PRE.
Crete, .	C. E. Chadsey,	50.1	—	4.20
Omaha,	A. Pollock,	50.9	—	1.77
Ashland,	Geo. Shedd,	—	—	2.90
Beaver Creek,	E. Smith,	56.0	37.5	2.84
Central City,	C. Shieldstream,	47.5	57.8	2.40
Dawson,	M. L. Libbee,	53.0	—	2.50
De Soto,	Chas. Seltz,	51.0	—	2.27
De Witt,	F. C. Ware,	—	—	—
Fairbury,	Dr. Humphrey,	—	64.7	3.88
Falls City,	A. B. Newkirk,	—	52.5	3.01
Fremont,	I. E. Heaton,	49.2	56.7	3.89
Harvard,	M. F. Wistrom,	—	—	—
Lincoln,	H. H. Wing,	49.9	—	—
Marquette,	J. Ellis,	—	57.3	2.44
Minden,	Joel Hull,	—	—	—
Mission Creek,	M. K. Walker,	49.0	62.0	2.62
Nebraska City,	J. B. Parmalee,	51.4	—	4.65
Stockham,	J. W. Gray,	—	62.1	1.60
Stromsburg,	S. S. Kauffman,	51.0	—	3.23
Syracuse,	P. W. Risser,	51.3	—	3.06
Weeping Water,	G. Treat,	49.6	—	2.50
West Hill,	J. L. Truman,	48.8	—	1.91
York,	D. P. Nicholson,	—	56.5	2.12

NORTH-EAST SECTION.

Neligh,	H. C. Huxford,	—	—	—
West Point,	E. G. Bruner,	—	59.1	2.40

NORTH MIDDLE.

Purdum,	T. C. Jackson,	—	—	3.25
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SOUTH MIDDLE.				
STATION.	OBSERVER.	MEAN.	NOON.	REL.
North Platte,	J. Fitzgerald,	47.2	—	2.09
Ogalalla,	Dr. L. M. Line,	46.0	—	—
Red Willow,	Mrs. R. Buck,	—	—	3.04
Sargent,	S. W. Perin,	—	—	—
WEST SECTION.				
Hay Springs,	Wm. Waterman,	40.6	—	1.83

WEATHER SIGNALS.

Hereafter a special weather prediction for Nebraska will be made by the chief signal officer and permission has been granted to this service to distribute the same by telegraph at government expense to any ten points in the state where observers might be secured to display signals in accordance with the telegrams.

Arrangements have accordingly been made with the following parties, to whom the telegrams will be sent at an early hour in the morning, beginning May 4th, 1886:

J. B. Parmalee, Nebraska City.

Albert Watkins, Lincoln.

S. S. Kauffman, Stromsburg.

S. L. Brass, Juniata.

Thomas Shryock, Louisville.

Jaeggi & Shupbach, Columbus.

C. L. Howell, Grand Island.

W. A. Wagner, Beatrice.

T. J. Pickett, Jr., Ashland.

F. L. Wheedon, York.

EXPLANATION OF SIGNALS.

Flags with the following figures upon them have been adopted to indicate certain changes of weather and the temperature, and will be displayed in some conspicuous place; the telegram itself, giving more explicit information than the flags, will also be posted in a bulletin frame in the post office:

Red sun—Higher temperature.

Red moon—Lower temperature.

Red star—Stationary temperature.

Black square—Cold wave.

Blue sun—General rain.

Blue moon—Clear or fair weather.

Blue star—Local rains.

The predictions cover the period of twenty-four hours, from seven o'clock of the morning of receipt to seven o'clock of the following morning.

DEFINITION OF TERMS.

"Higher temperature," or "warmer weather," means that the temperature will be higher at seven o'clock of the following morning than at seven o'clock on the morning of receipt.

"Slightly higher" means that the change will not probably amount to ten degrees.

"Lower temperature" and "slightly lower" are to be interpreted in a similar manner.

"Stationary temperature" means that it will not be more than five degrees warmer or cooler on the following morning than on the morning of receipt.

By a "cold wave" is meant a more sudden and decided fall of temperature of say fifteen or twenty degrees or more.

"General rain" means a fall of a *measurable* amount of rain during the twenty-four hours from seven o'clock of the morning of receipt to the following morning.

By "local rains" is meant that rainfall may be expected at various points in the state during the above mentioned period, though not necessarily at a particular station.

"Fair weather" means the absence of any *measurable* amount of rainfall during the time.

CROP REPORT.

Chas. Seltz, De Soto, reports: "A good deal of oats sowed this spring and it looks finely; prospects for fruit also fine. The slight frost of the 27th seems not to have hurt much of anything."

Dr. Humphrey, Fairbury: "Crops are doing finely at this time. Only one slight hail on the 28th; did but little damage."

MAY.

The opening of the season of 1886 has been peculiar; the prophecy of "a late season because Easter came late" seemed likely to be verified, but the month of May, following upon a March and an April of unprecedented snow fall, has been the warmest May since 1881, and has seemed like the coming of summer upon the heels of winter without an intervening spring.

The latest frost of the season came with an area of high barometer that overspread the country passing eastward on the 15th and 16th; the frost was light, doing no particular damage; it was reported from the western part of the state (Hay Springs, Stockham and Beaver Creek) on the morning of the 15th, and from the eastern (Fairbury, Weeping Water and De Soto) on the 16th, on which date frost also occurred in Wisconsin and Michigan.

The month has been on the average five degrees warmer than the normal temperature for May. Rainfall has been about normal.

C. Shieldstream reports that the backwardness of the early spring interfered considerably with the seeding of low grounds and the picking of last year's corn crop, but "grain on the highlands is well advanced."

A. B. Newkirk, of Falls City, reports on the 11th "a tornado, southwest of town at 9:30 A.M., going south, and another north of town at 9:20 going north, but neither came to the ground in sight of town."

F. C. Ware, of DeWitt, reports a severe storm on the 22d, doing serious damage over a strip two or three miles wide; the temperature fell from 103° to 56° during its passage.

WIND.

The average wind velocities for the month were as follows:

Omaha.....	5.7 miles per hour.
North Platte.....	8.1 " " "
Crete.....	8.8 " " "

PRECIPITATION.

The average rain for the different sections of the state for April, 1886, is as follows:

	Inches.
Northeast section (one station).....	2.80
North middle (no station).....	—
West (one station).....	1.80
South middle (two stations).....	3.35
Southeast (covering essentially what has heretofore been the "whole state" as far as reporting)	4.55
State average by sections	3.12

COMPARISON OF PAST MAYS.

The table shows the mean temperature, the noon temperature, and the number of days above 85° for the past nine Mays in south-eastern Nebraska; they are found by averaging the numbers reported at the different stations. It also shows the highest temperature and the lowest temperature recorded anywhere in the state by standard, self-registering thermometers:

May.	Mean Temp.	Noon Temp.	Above 85°.	Highest Temp.	Lowest Temp.
1878	55.8	68.6	—	—	—
1879	64.8	76.1	7.4	91	30
1880	67.2	79.7	10.2	94	37
1881	67.2	75.7	6.3	90	—
1882	56.4	62.7	1	89	—
1883	58.5	64.7	1.6	93	35
1884	59.8	71.2	0.3	88	32
1885	58.3	67	1	86.5	28.7
1886	65	75.8	6.9	93	25

The following table shows the precipitation or depth in inches of rain and melted snow or hail, the number of days on which it fell, and the number of cloudy and clear days. Days are counted cloudy when the sky is four-fifths overcast; clear when less than one-third. The last column shows the number of thunder storms:

May.	Precipitation.	Days of precip.	Cloudy days.	Clear days.	Thunder.
1878	4.48	8.6	7.9	11.8	3.4
1879	4.02	7.5	4.4	11.7	6.8
1880	2.62	5.2	3.6	14.5	4.9
1881	6.94	10.3	7.5	4.6	7.3
1882	4.44	11.2	11.5	5.8	4
1883	5.65	11.7	8.6	7	6.1
1884	2.76	7.3	6.5	11.2	5.6
1885	4.11	8.2	6	13.7	3.4
1886	4.55	11	3.8	14	6.6

LOCAL REPORTS.

The following are the mean temperatures, noon temperatures, and precipitations reported by various observers:

SOUTH-EAST SECTION.

STATION.	OBSERVER.	MEAN.	NOON.	PRE.
Crete,	C. E. Chadsey,	65.3	—	3.39
Omaha,	A. Pollock,	65.1	—	4.58
Ashland,	Geo. Shedd,	—	74.7	5.29
Beaver Creek,	E. Smith,	—	73.7	3.61
Central City,	C. Shieldstream,	61.2	74.4	7.20
Dawson,	M. L. Libbee,	—	—	—
De Soto,	Chas. Seltz,	65.1	—	2.16
De Witt,	F. C. Ware,	—	77.7	3.60
Fairbury,	Dr. Humphrey,	—	80.3	4.66
Falls City,	A. B. Newkirk,	67.3	79.3	2.52
Fremont,	I. E. Heaton,	64.6	73.6	3.41
Harvard,	M. F. Wistrom,	—	—	—
Lincoln,	H. H. Wing,	—	—	—
Marquette,	J. Ellis,	—	72.8	6.27
Minden,	Joel Hull,	66.1	—	5.83
Mission Creek,	M. K. Walker,	—	—	—
Nebraska City,	J. B. Parmalee,	65.1	—	5.37
Stockham,	J. W. Gray,	—	78.2	4.30
Stromsburg,	S. S. Kauffman,	65	—	5.52
Syracuse,	P. W. Risser,	67.2	—	5.15
Weeping Water,	G. Treat,	63.2	—	4.55
West Hill,	J. L. Truman,	64.4	—	4.37
York,	D. P. Nicholson,	—	73.6	4.56

NORTH-EAST SECTION.

West Point,	E. G. Bruner,	—	73.2	2.80
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NORTH MIDDLE.

Purdum,	T. C. Jackson,	—	—	—
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SOUTH MIDDLE.

North Platte,	J. Fitzgerald,	63	—	3.67
Ogallala,	Dr. L. M. Line,	70.5	—	—
Red Willow,	Mrs. R. Buck,	—	—	3.03
Sargent,	S. W. Perin,	—	—	—

WEST SECTION.

Hay Springs,	Wm. Waterman,	59.3	—	1.80
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WEATHER SIGNALS.

During the month weather predictions have been telegraphed to the following points, and weather signals displayed. The table shows

the total number of predictions, and how many of them have failed, both in respect to temperature and to weather:

STATION.	FLAGSMAN.	PRED'NS.	FAILURES.	
			Tem.	Wea.
Crete,	C. F. Chadsey,	21	7	13
Nebraska City,	J. B. Parmalee,	27	6	11
Lincoln,	Albert Watkins,	—	—	—
Stromsburg,	S. S. Kauffman,	24	3	6
Juniata,	S. L. Brass,	26	3	—
Louisville,	Thomas Shryock,	27	1	9
Columbus,	E. C. Brake,	—	—	—
Grand Island,	C. L. Howell,	28	1	—
Beatrice,	W. A. Wagner,	27	0	10
Ashland,	T. J. Pickett, Jr.,	—	—	—
York,	F. L. Wheedon,	—	—	—

This gives as the average per cent of correct predictions for the state:

Temperature	89
Weather	64.4
Mean	76.7

JUNE.

The month of June was in the most respects a month of normal conditions and one generally favorable to the growth of crops. The temperature was almost exactly the average of the past eight Junes, though less than usual of extremely hot days. The rainfall was slightly deficient but more evenly distributed through the month than usual. There were few severe storms.

Observer S. S. Kauffman, of Stromsburg, reports the heaviest rain ever known on the 14th with a strong wind and some hail, but no great damage done; but at Osceola both rain and hail did considerable damage.

D. P. Nicholson reports one of the heaviest rains of the season at York on the 6th.

CROP REPORT.

Merrick Co.—“The crop of wheat and oats seems under an average; corn may be one-half of the crop of 1885.”—C. Shieldstream.

Hamilton Co.—“Wheat thin, rusty, and weedy generally; some complaint of chinch bugs; the prospect is not good for more than

half average. Oats better than wheat. Corn late; weedy, uneven, and not good stand; prospects two-thirds of average. Flax prospects good, potatoes the same."—John Ellis.

Blaine Co.—"Hail storm on the 18th damaged crops somewhat over a small scope of country."—T. C. Jackson.

WIND.

The average wind velocities for the month were as follows:

Omaha.....	5.5 miles per hour.
North Platte.....	8.8 " " "
Crete.....	7.7 " " "

PRECIPITATION.

The average rain for the different sections of the state for June, 1886, is as follows:

	Inches.
N. E. section (one station).....	2.30
North middle (no station).....	—
West (one station).....	2.66
South middle (two stations).....	2.31
S. E. (covering essentially what has heretofore been the "whole state" as far as reporting	4.22
State average by sections.....	2.87

COMPARISONS OF PAST JUNES.

The table shows the mean temperature, the noon temperature, and the number of days above 85° for the past nine Junes in south-eastern Nebraska; they are found by averaging the numbers reported at the different stations. It also shows the highest temperature and the lowest recorded anywhere in the state by standard, self-registering thermometers:

June.	Mean Temp.	Noon Temp.	Above 85°.	Highest Temp.	Lowest Temp.
1878	66.7	77.8	8.5	—	—
1879	69.9	81.0	11.4	92	49
1880	73.4	81.1	11.6	97	46
1881	74.1	82.8	12.4	95	58
1882	72.2	79.5	11.4	93.1	45.7
1883	69.4	77.8	3.6	96	42
1884	71.9	81.7	14.2	94	44.8
1885	65.8	78.8	9	93.8	42.8
1886	70.0	80.3	8.7	80.1	33

The following table shows the precipitation or depth in inches of rain and melted snow or hail, the number of days on which it fell, and the number of cloudy and of clear days. Days are counted cloudy when the sky is four-fifths overcast; clear when less than one-third. The last column shows the number of thunder storms:

June.	Precipitation.	Days of precip.	Cloudy days.	Clear days.	Thunder.
1878	5.98	8.2	4.	12.7	4.6
1879	4.94	8.2	3.1	14.1	5.6
1880	5.27	7.1	3.6	12.9	6.5
1881	5.18	8.1	1.6	12.3	8.8
1882	5.24	10.5	5.8	8.6	10.3
1883	9.44	11.2	3.7	13.	9.
1884	2.48	5.9	2.7	11.3	6.7
1885	2.77	8.	4.2	13.4	5.8
1886	4.22	8.9	1.9	15.	5.2

LOCAL REPORTS.

The following are the mean temperatures, noon temperatures, and precipitations reported by various observers:

SOUTH-EAST SECTION.

STATION.	OBSERVER.	MEAN.	NOON.	PRE.
Crete,	C. E. Chadsey,	68.7	—	6.10
Omaha,	A. Pollock,	70.2	—	1.50
Ashland,	Geo. Shedd,	—	79.5	3.34
Beaver Creek,	E. Smith,	—	78.2	1.57
Central City,	C. Shieldstream,	69.1	79.7	1.70
Dawson,	M. L. Libbie,	—	—	—
De Soto,	Chas. Seltz,	71.9	—	1.62
De Witt,	F. C. Ware,	—	89.3	7.10
Fairbury,	Dr. Humphrey,	—	—	3.97
Falls City,	A. B. Newkirk,	72.6	82.6	7.87
Fremont,	I. E. Heaton	69.0	78.3	2.89
Harvard,	M. F. Wistrom,	—	—	—
Lincoln,	H. H. Wing,	—	78.9	—
Marquette,	J. Ellis,	—	76.9	2.23
Minden,	Joel Hull,	73.0	—	2.6
Mission Creek,	M. K. Walker,	68.0	78.0	8.38
Nebraska City,	J. B. Parmelee,	61.6	—	4.42
Stockham,	J. W. Gray,	—	—	—
Stromsburg,	S. S. Kauffman,	70.9	—	8.37
Syracuse,	P. W. Risser,	72.5	—	4.81
Weeping Water,	G. Treat,	67.6	—	5.47
West Hill,	J. L. Truman,	70.2	—	3.82
York,	D. P. Nicholson,	—	79.0	6.50

NORTH-EAST SECTION.				
STATION.	OBSERVER.	MEAN.	NOON.	EEB.
West Point,	E. G. Bruner,	—	—	2.30
NORTH MIDDLE.				
Purdum,	T. C. Jackson,	—	—	—
SOUTH MIDDLE.				
North Platte,	J. Fitzgerald,	67.6	—	1.14
Ogallala,	Dr. L. M. Line,	68.9	—	—
Red Willow,	Mrs. R. Buck,	—	—	3.48
Sargent,	S. W. Perin,	—	—	—
WEST SECTION.				
Hay Spring,	Wm. Waterman,	63.9	—	2.66
WEATHER SIGNALS.				

During the month weather predictions have been telegraphed to the following points and weather signals displayed. The table shows the total number of predictions and how many of them have failed, both in respect to temperature and to weather:

STATION.	FLAGSMAN.	PRED'NS.	FAILURES.	
			Tem.	Wea.
Crete,	C. F. Chadsey,	30	8	9
Nebraska City,	J. B. Parmalee,	—	—	—
Lincoln,	Albert Watkins,	—	—	—
Stromsburg,	S. S. Kauffman,	28	5	3
Juniata,	S. L. Brass,	30	0	2
Louisville,	Thos. Shryock,	30	—	5
Columbus,	E. C. Brake,	23	2	4
Grand Island,	C. L. Howell,	30	4	—
Beatrice,	W. A. Wagner,	30	—	6
Ashland,	T. J. Pickett, Jr.,	—	—	—
York,	F. L. Wheedon,	—	—	—

This gives as the per cent of correct predictions for the state:

Temperature.....	86.7
Weather.....	82.7
Mean.....	84.7

JULY.

The striking deficiency in rainfall for the month of July was its most marked feature; this deficiency extended throughout the United States except along the Atlantic and Pacific coasts, but was more marked in eastern Nebraska and Iowa than elsewhere, Omaha having

the greatest deficiency of any U. S. signal service station and Des Moines and Keokuk next.

The month was also marked by the extreme heat of a few days. Never before since the service began has a temperature of 100° been indicated by standard thermometers properly exposed.

CROP REPORT.

Washington Co. : Crops on bottom lands look well, potatoes, corn and small grain; hay on upland is light; late corn and late potatoes suffered from the drouth.—Chas. Seltz.

Otoe Co. : Small grain and hay both are of good quality and yield. There are some excellent fields of corn, but the majority, on account of late and rainy spring, will not average more than half a crop.—P. W. Risser.

Richardson Co. : If we get no general rain within a week corn will be but one third of a crop.—A. B. Newkirk.

Hamilton Co. : Corn has about held its own during the month; the drought, up to the 19th, has not been more than offset by the good growing weather since. Wheat suffered from drought and chinch bugs; rain came too late to help it much; not more than half average. Oats good, especially late ones. Late flax good, but early flax suffered from drought. Potatoes suffered twenty-five per cent.—John Ellis.

Merrick Co. : There is more difference this year than commonly between crops. In rich and well cultivated fields where the land could be put in early and in good shape the crops are excellent; some wheat already threshed yields ten bushels per acre, but some will yield more, though the most will yield much less. The best prospect of the corn crop of 1886 will be more than half that of 1885.—C. Shieldstream.

Polk Co. : Wheat is about half a crop, good quality. Rye but little sown, good. Oats a fair crop. Millet and hay crops good. Flax generally good; some of it very weedy. Corn at present promises a fair average crop; some of it uneven and late; stalks generally short, but with good weather from now on will get an average crop.—S. S. Kauffman.

Saline Co.: Corn will be about one-half a crop; wheat and oats are yielding about ten bushels for wheat and forty to fifty for oats; quality of grain good.—F. C. Ware.

WIND.

The average wind velocities for the month were as follows:

Omaha.....	5.4 miles per hour.
North Platte.....	8.6 " " "
Crete.....	7.2 " " "

PRECIPITATION.

The average rain for the different sections of the state for July, 1886, is as follows:

	Inches.
N. E. Section (one station).....	—
North Middle (one station).....	—
West (one station).....	3.09
South Middle (two stations).....	1.54
S. E. (covering essentially what has heretofore been the "whole state" as far as reporting.....	1.31
State average by sections.....	1.98

COMPARISON OF PAST JULYS.

The table shows the mean temperature, the noon temperature, and the number of days above 85° for the past nine Julys in south-eastern Nebraska; they are found by averaging the numbers reported at the different stations. It also shows the highest temperature and the lowest recorded anywhere in the state by standard, self-registering thermometers:

July.	Mean Temp.	Noon Temp.	Above 85°.	Highest Temp.	Lowest Temp.
1878	77.4	87.6	15.1	96	52
1879	76.1	87.6	18.1	97	64
1880	75	86.9	18.9	97	54
1881	78.1	87.5	22.1	95.7	63.4
1882	70.6	79.2	8.2	99	75.2
1883	76	84.7	15.1	99	52
1884	74.8	83.3	12.6	97.3	52.4
1885	75.5	82.6	13.4	97.8	51.2
1886	77.4	87.5	24.6	102.4	54.7

The following table shows the precipitation or depth in inches of rain or melted snow or hail, the number of days on which it fell, and

the number of cloudy and clear days. Days are counted cloudy when the sky is four-fifths overcast; clear when less than one third. The last column shows the number of thunder storms:

July.	Precipitation.	Days of Precip.	Cloudy Days.	Clear Days.	Thunder.
1878	6.36	8	1.5	16.7	6.4
1879	5.56	8.6	2	11.7	6
1880	3.83	6.8	1	18	6.2
1881	3.53	5	1.8	13.4	4.9
1882	3.89	8.2	3.3	13.6	7.9
1883	3.18	8.1	4.1	13.6	6.4
1884	6.94	11	4.4	11	9.4
1885	5.27	9.6	6.6	14.8	6.1
1886	1.31	4.5	3.3	20.5	2.8

LOCAL REPORTS.

The following are the mean temperatures, noon temperatures, and precipitations reported by various observers:

SOUTH-EAST SECTION.

STATION.	OBSERVER.	MEAN.	NOON.	PRE.
Crete,	C. E. Chadsey,	75.7	—	0.33
Omaha,	A. Pollock,	77.3	—	0.69
Ashland,	Geo. Shedd,	—	89.3	1.06
Beaver Creek,	E. Smith,	—	86.6	3.91
Central City,	C. Shieldstream,	79.6	89.3	2.70
Dawson,	M. L. Libbee,	—	—	—
De Soto,	Chas. Seltz,	78.4	—	0.70
De Witt,	F. C. Ware,	—	89.1	0.10
Fairbury,	Dr. Humphrey,	—	—	0.49
Falls City,	A. B. Newkirk,	78.7	90.0	0.26
Fremont,	I. E. Heaton,	76.9	86.9	—
Harvard,	M. F. Wistrom,	—	—	—
Lincoln,	H. H. Wing,	—	—	—
Marquette,	J. Ellis,	—	85.0	2.55
Minden,	Joel Hull,	—	—	—
Mission Creek,	M. K. Walker,	—	—	—
Nebraska City,	J. B. Parmalee,	—	—	—
Stockham,	J. W. Gray,	—	94.0	2.40
Stromsburg,	S. S. Kauffman,	77.5	—	1.95
Syracuse,	P. W. Risser,	79.0	—	1.86
Weeping Water,	G. Treat,	73.3	—	0.25
West Hill,	J. L. Truman,	—	—	—
York,	D. P. Nicholson,	—	84.5	2.37

NORTH-EAST SECTION.

West Point,	E. G. Bruner,	—	—	—
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NORTH MIDDLE.				
STATION.	OBSERVER.	MEAN.	NOON.	PRE.
Purdum,	T. C. Jackson,	—	—	—
SOUTH MIDDLE.				
North Platte,	J. Fitzgerald,	76.5	—	0.63
Ogallala,	Dr. L. M. Line,	77.4	—	—
Red Willow,	Mrs. R. Buck,	—	—	2.41
WEST SECTION.				
Hay Springs,	Wm. Waterman,	74.8	—	3.09

WEATHER SIGNALS.

During the month weather predictions have been telegraphed to the following points and weather signals displayed. The table shows the total number of predictions and how many of them have failed, both in respect to temperature and to weather:

STATION.	FLAGSMAN.	PRED'NS.	FAILURES.	
			Tem.	Wea.
Crete,	C. E. Chadsey,	31	8	15
Nebraska City,	J. B. Parmalee,	—	—	—
Lincoln,	Albert Watkins,	—	—	—
Stromsburg,	S. S. Kauffman,	30	7	10
Juniata,	S. L. Brass,	31	0	3
Louisville,	Thos. Shryock,	31	0	13
Columbus,	E. C. Brake,	3	6	7
Grand Island,	C. L. Howell,	—	—	—
Beatrice,	W. A. Wagner,	31	5	5
Ashland,	T. J. Pickett, Jr.,	—	—	—
York,	F. L. Wheedon,	—	—	—
Fairbury,	W. W. Watson,	30	3	11

This gives as the per cent of correct predictions for the state:

Temperature.....	88.6
Weather.....	71.5
Mean	80.1

AUGUST.

The weather for August has presented no striking peculiarities, unless it be the occurrence of a decidedly cool wave at the very close of the month; the mean temperature has been slightly above the average for August, and the highest temperatures of the month have also been above those of August commonly, having been exceeded

only once in eight years, viz., in 1881. But on the morning of the 29th a cool wave appeared in the north-west, and moved in a south-easterly direction, causing a decided fall in temperature in all directions on the 30th and 31st. During its passage frosts were reported in Dakota, Minnesota, Wisconsin, and Nebraska, and killing frost in southern Dakota. The frost was very slight in Nebraska.

The precipitation has not shown the great deficiency that has prevailed for the past few months, being but slightly below the normal for the month over the state generally, while in certain districts in the central part of the state it has been large, the greatest rainfall being 9.5 inches, at Minden.

CROP REPORT.

Gass Co.: Corn at this date is doing splendidly, and in some pieces of corn that were tended well will average a full crop. Small grain is good; fruit very plentiful; apples sold as low as thirty cents per bushel.—G. Treat.

Richardson Co.: Crops generally are better than were expected; we have not suffered much with the drought, and prospects are favorable for a good crop; small grain is nearly all threshed, and the yield was good.—Alfred Minnick.

Corn in this vicinity will yield about two-thirds of a crop.—A. B. Newkirk.

Hamilton Co.: Corn seventy-five per cent of average; chinch bugs are very numerous and are injuring it. Wheat was little threshed; threshers report an average of about eight bushels per acre, oats forty to fifty bushels, flax five to thirteen.—John Ellis.

Polk Co.: No change from last report on small grain; corn and broom corn are good; potatoes below the average.—S. S. Kauffman.

WIND.

The average wind velocities for the month were as follows:

Omaha.....	5.8 miles per hour.
North Platte.....	8.2 " " "
Crete.....	7.9 " " "

PRECIPITATION.

The average rain for the different sections of the state for August 1886, is as follows:

	Inches.
Northeast section (one station).....	3.60
North middle (no station)	—
West (one station).....	2.32
South middle (two stations)	2.14
Southeast (covering essentially what has heretofore been the "whole state" as far as reporting).....	2.97
State average by sections	2.58

COMPARISON OF PAST AUGUSTS.

The table shows the mean temperature, the noon temperature, and the number of days above 85° for the past nine Augusts in south-eastern Nebraska; they are found by averaging the numbers reported at the different stations. It also shows the highest temperature and the lowest recorded anywhere in the state by standard, self-registering thermometers:

Aug.	Mean Temp.	Noon Temp.	Above 85°.	Highest Temp.	Lowest Temp.
1878	75.7	87.3	—	97	51
1879	74.4	84.8	—	95	55
1880	75	87	—	97	51
1881	79.5	91.2	25	100	63
1882	73	85	18.4	91	52.2
1883	74.1	81.8	9.6	92.3	47
1884	70.2	77.4	3	93	46
1885	69.9	78.2	9.2	91	47.3
1886	75.8	85.6	19.7	99.8	40

The following table shows the precipitation or depth in inches of rain and melted snow or hail, the number of days on which it fell, and the number of cloudy and of clear days. Days are counted cloudy when the sky is four-fifths overcast; clear when less than one-third. The last column shows the number of thunder storms:

Aug.	Precipi- tation.	Days of precip.	Cloudy days.	Clear days.	Thun- der.
1878	3.14	4	0.7	21	4
1879	2.09	5	1.9	18.4	5.4
1880	4.86	7.1	4.8	17	5.7
1881	1.59	3.7	3.2	17.4	4.4
1882	1.58	4	1.9	18.6	3.4
1883	3.58	7.6	4.4	13.6	4.4
1884	3.76	7.1	7	13.7	2.9
1885	3.96	7.9	4.8	13.8	5.7
1886	2.97	7	3.7	15	1.3

LOCAL REPORTS.

The following are the mean temperatures, noon temperatures, and precipitations reported by various observers:

SOUTH-EAST SECTION.				
STATION.	OBSERVER.	MEAN.	NOON.	PRE.
Crete,	C. E. Chadsey,	75	—	3.24
Omaha,	A. Pollock,	75.6	—	2.53
Ashland,	George Shedd,	—	—	—
Ravenna,	E. Smith,	—	85	2.76
Central City,	C. Shieldstream,	76.6	87.1	2.30
Dawson,	M. L. Libbee,	—	—	—
De Soto,	Charles Seltz,	78	—	2.71
De Witt,	F. C. Ware,	—	—	—
Fairbury,	Dr. Humphrey,	—	91	3.49
Falls City,	A. B. Newkirk,	79.6	90.2	1.37
Fremont,	I. E. Heaton,	74.1	83.5	2.77
Harvard,	M. F. Wistrom,	—	—	—
Lincoln,	H. H. Wing,	—	—	—
Marquette,	J. Ellis,	—	82.9	3.73
Minden,	Joel Hull,	76.8	—	9.50
Mission Creek,	M. K. Walker,	—	—	—
Nebraska City,	J. B. Parmatee,	76.3	—	1.36
Stockham,	J. W. Gray,	—	—	—
Stromsburg,	S. S. Kauffman,	76.4	—	3.42
Syracuse,	P. W. Risser,	—	—	—
Weeping Water,	G. Treat,	73.9	—	3
West Hill,	J. L. Truman,	76	83	3.29
York,	D. P. Nicholson,	—	83	4.75
NORTH-EAST SECTION.				
West Point,	E. G. Bruner,	—	88.4	3.60
NORTH MIDDLE.				
Purdum,	T. C. Jackson,	—	—	—
SOUTH MIDDLE.				
North Platte,	J. Fitzgerald,	73.2	—	1.99
Ogallala,	Dr. L. M. Line,	76.3	—	—
Red Willow,	Mrs. R. Buck,	—	—	2.28
WEST SECTION.				
Hay Springs,	Wm. Waterman,	68.9	—	2.32

WEATHER SIGNALS.

During the month weather predictions have been telegraphed to the following points, and weather signals displayed. The table shows the total number of predictions and how many of them failed, both in respect to temperature and to weather:

STATION.	FLAGSMAN.	PRED'NS.	FAILURES.	
			Tem.	Wea.
Crete,	C. E. Chadsey,	31	8	11
Nebraska City,	J. B. Parmalee,	31	6	7
Lincoln,	Albert Watkins,	31	0	12
Stromsburg,	S. S. Kauffman,	31	6	9
Juniata,	S. L. Brass,	31	2	4
Louisville,	Thomas Shryock,	31	1	8
Columbus,	E. C. Brake,	31	12	12
Grand Island,	C. L. Howell,	—	—	—
Beatrice,	W. A. Wagner,	—	—	—
Ashland,	T. J. Pickett, Jr.,	—	—	—
York,	F. L. Wheedon,	—	—	—
Fairbury,	W. W. Watson,	—	—	—
Falls City,	A. Minnick,	30	2	6

This gives as the per cent of correct predictions for the state:

Temperature	85
Weather.....	71.7
Mean	78.4

SEPTEMBER.

Like the month of August there has been no marked peculiarity in the weather of September unless it is the cold wave, the first of the season, that appeared on the night of the 29th in Minnesota, and extended on the 30th to east Dakota, Iowa, Nebraska, Wisconsin, Michigan, Illinois, Missouri, Indiana, and Ohio, with a minimum temperature of 33.8 in Nebraska, below 30° in Minnesota and east Dakota, falling as low as 10° at Moorhead, Minn. This was predicted as a cool wave although cold wave flags were not ordered up; but the temperature fell lower than was expected.

Four storms of moderate severity were felt in Nebraska during the month. The first appeared in northern Dakota on the 14th and was joined on the 15th by a storm which formed in northern Kansas, thence united they passed eastward, moving out of the Saint Lawrence Valley on the 17th. The second appeared in the Indian Territory on the 18th and moved very rapidly eastward, passing out of the Saint Lawrence Valley on the 19th. The third formed in Colorado on the 24th and, moving northeastward, disappeared north of Lake

Huron on the 27th. The fourth formed in Colorado on the 26th and, passing northeastward, moved out of the Saint Lawrence Valley on the 28th. All these were attended by more or less rainfall in the state.

CROP REPORT.

Cass Co.: Corn is better than was expected; some damage done to hay.—G. Treat.

Richardson Co.: Corn will yield about forty bushels; some say they have never raised better. Threshing is nearly all done and the yield was on the average with other years.—Alfred Minnick.

Jefferson Co.: The month has been rather unusual, having ten rains making five inches of water; yet the mean temperature has been sufficient for a fine growth of vegetation. Corn is a better crop than we expected.—Dr. Humphrey.

Hamilton Co.: Wheat averages from two and a quarter to ten bushels per acre; oats from twenty-nine to fifty-five; flax from four to thirteen; hay medium but much spoiled with rain; chinch bugs still numerous; corn still promises three-quarters of a crop.—John Ellis.

York Co.: Corn is well eared, but stands thin on the ground; will average rather light.—Prof. Nicholson.

WIND.

The average wind velocities for the month were as follows:

Omaha.....	7.7 miles per hour.
North Platte.....	8.1 " " "
Crete.....	— " " "

PRECIPITATION.

The average rain for the different sections of the state for September 1886, is as follows:

N. E. Section (one station).....	3.25
North Middle (no station).....	—
West (one station).....	0.37
South middle (two stations).....	1.22
S. E. (covering essentially what has heretofore been the "whole state" as far as reporting).....	3.59
State average by sections.....	2.11

COMPARISON OF PAST SEPTEMBERS

The table shows the mean temperature, the noon temperature, and the number of days above 85° for the past nine Septembers in south-eastern Nebraska; they are found by averaging the numbers reported at the different stations. It also shows the highest temperature and the lowest recorded anywhere in the state by standard, self-registering thermometers :

Sept.	Mean Temp.	Noon Temp.	Above 85°.	Highest Temp.	Lowest Temp.
1878	65.5	75.9	5.3	91	33.
1879	61.1	75.1	3.9	91	28.
1880	64.2	73.8	3.7	93	34.
1881	67.3	76.5	10.3	99	36.
1882	67.5	80.8	10.8	94	40.3
1883	60.8	70.7	2.0	91	37.
1884	67.9	76.1	6.3	91.8	39.
1885	64.	78.0	5.0	92	42.6
1886	65.4	75.5	9.2	93.3	33.8

The following table shows the precipitation or depth in inches of rain and melted snow or hail, the number of days on which it fell, and the number of cloudy and of clear days. Days are counted cloudy when the sky is four-fifths overcast; clear when less than one-third. The last column shows the number of thunder storms :

Sept.	Precipi- tation.	Days of Precip.	Cloudy Days.	Clear Days.	Thun- der.
1878	2.58	4.3	1.9	18.7	2.2
1879	1.86	5.1	1.5	19.	2.8
1880	3.41	6.9	2.5	16.5	4.3
1881	4.05	6.5	3.8	17.2	5.5
1882	0.92	1.9	1.4	19.3	2.
1883	3.38	7.1	6.4	14.	3.5
1884	2.99	5.8	6.3	13.	4.9
1885	2.34	6.2	6.	16.4	2.7
1886	3.59	9.9	4.9	12.5	4.7

LOCAL REPORTS.

The following are the mean temperatures, noon temperatures, and precipitations reported by various observers :

SOUTH-EAST SECTION.

STATION.	OBSERVER.	MEAN.	NOON.	PRE.
Crete,	C. E. Chadsey,	64.1	—	3.21
Omaha,	A. Pollock,	65.1	—	4.45
Ashland,	Geo. Shedd,	—	75.0	5.42

STATION.	OBSERVER.	MEAN.	NOON.	PRE.
Ravenna,	E. Smith,	—	75.8	3.05
Central City,	C. Shieldstream,	68.4	76.8	2.75
Dawson,	M. L. Libbee,	—	—	—
De Soto,	Chas. Seltz,	64.9	—	3.53
De Witt,	F. C. Ware,	—	74.3	5.50
Fairbury,	Dr. Humphrey,	—	—	5.24
Falls City,	A. B. Newkirk,	71.1	79.1	5.26
Fremont,	I. E. Heaton,	63.6	71.2	3.39
Harvard,	M. F. Wistrom,	—	—	—
Lincoln,	H. H. Wing,	—	—	—
Marquette,	J. Ellis,	—	72.9	3.85
Minden,	Joel Hull,	—	—	2.91
Mission Creek,	M. K. Werk,	68.0	—	4.00
Nebraska City,	J. B. Parmalee,	63.5	—	4.00
Stockham,	J. W. Gray,	—	73.5	1.85
Stromsburg,	S. S. Kauffman,	63.9	—	3.18
Syracuse,	P. W. Risser,	—	—	1.76
Weeping Water,	G. Treat,	63.7	—	5.87
West Hill,	J. L. Truman,	63.9	—	3.18
York,,	D. P. Nicholson	—	74.0	2.38

NORTH-EAST SECTION.

West Point,	E. G. Bruner,	—	71.6	3.25
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NORTH MIDDLE.

Purdum,	T. C. Jackson,	—	—	—
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SOUTH MIDDLE.

North Platte,	J. Fitzgerald,	61.7	—	1.32
Ogallala,	Dr. L. M. Line,	63.5	—	—
Red Willow,	Mrs. R. Buck,	—	—	2.28

WEST SECTION.

Hay Springs,	Wm. Waterman,	57.8	—	0.37
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WEATHER SIGNALS.

During the month weather predictions have been telegraphed to the following points and weather signals displayed. The table shows the total number of predictions and how many of them have failed, both in respect to temperature and to weather :

STATION.	FLAGSMAN.	PRED'NS.	FAILURES.	
			Tem.	Wea.
Crete,	C. E. Chadsey,	—	—	—
Nebraska City,	J. B. Parmalee,	—	—	—
Lincoln,	Albert Watkins,	—	—	—
Stromsburg,	S. S. Kauffman,	27	7	6
Juniata,	S. L. Brass,	30	3	2
Louisville,	Thos. Shryock,	30	1	6

STATION.	FLAGSMAN.	PRED'NS.	FAILURES.	
			Tem.	Wea.
Columbus,	E. C. Brake,	30	12	12
Grand Island,	C. L. Howell,	30	2	2
Beatrice,	W. A. Wagner,	—	—	—
Ashland,	T. J. Pickett, Jr.,	—	—	—
York,	F. L. Wheedon,	—	—	—
Fairbury,	W. W. Watson,	—	—	—
Falls City,	A. Minnick.	—	3	16

This gives as the per cent of correct predictions for the state :

Temperature.....	83.
Weather.....	81.9
Mean.....	82.4

OCTOBER.

WEATHER REPORT.

The weather for October has been warm, dry, clear, and with greater extremes than usual, both of cold and heat.

Two storms of some severity have been felt in south-eastern Nebraska. The first came from the north-west on the 13th and united with one from the gulf region—the same that caused the severe floods in Louisiana on the 12th and 13th—forming a storming area extending throughout the Mississippi valley, central in Iowa. This brought rain in eastern Nebraska, and the lowest barometer of the month. A second storm passed on the 22d and 23d.

As will be seen by the tables, the temperature for the month was about three degrees above the normal, being the warmest October since 1879. The rainfall was less than for any October since 1878, being about half the normal amount.

CROP REPORT.

At this date there is little occasion to report upon the condition of crops from the several counties. As will be seen by reference to the bulletin for last month, the corn crop in nearly all sections proved better than was expected.

With the opening of the season of 1887 careful statements of the condition of crops will again be given in these bulletins, and as a systematic canvass of the state is about to be made with reference to securing observers in all parts of the state, especially in the northern

and western counties, it is believed that these crop reports will be of much value to the press and public.

ASTRONOMICAL REPORT.

It is intended hereafter to publish in these bulletins brief notes upon astronomical subjects such as may be of interest to the public.

The chief event of astronomical interest for October is the discovery of a small telescopic comet on the 5th by Prof. Barnard, of Nashville, Tennessee. On the morning of the 6th a faint tail was seen, and a small central nucleus. The comet will increase in brightness until early in December, after which it will grow fainter, but it will not probably be conspicuous to the naked eye at any time.

The evening skies are not now of special interest; none of the planets are visible in the evening except Saturn, which rises about nine o'clock, and Uranus, which crosses the meridian about one o'clock A.M., but is difficult to distinguish by the naked eye from a star.

About the middle of November Mercury will be visible, for a few days, to the naked eye, by close looking in the western sky soon after sunset. It should be looked for a few degrees above the horizon, and a little south of the sunset point.

TABLES.

The following are the mean temperatures, noon temperatures, and precipitations reported by various observers:

SOUTH-EAST SECTION.

STATION.	OBSERVER.	MEAN.	NOON.	PRE.
Crete,	C. E. Chadsey,	57	—	0.71
Omaha,	A. Pollock,	58.3	—	1.33
Ashland,	George Shedd,	—	—	1.14
Ravenna,	E. Smith,	—	65.8	0
Central City,	C. Shieldstream,	55.3	—	0.50
Dawson,	M. L. Libbee,	—	—	—
De Soto,	Charles Seltz,	57.6	—	2.74
De Witt,	F. C. Ware,	—	61.2	1.60
Fairbury,	Dr. Humphrey,	—	—	1.92
Falls City,	A. B. Newkirk,	60.3	—	3.26
Fremont,	I. E. Heaton,	56.5	66.9	0.95
Harvard,	M. F. Wistrom,	—	—	—
Lincoln,	J. G. White,	57.6	—	0.68

STATION.	OBSERVER.	MEAN.	NOON.	PRE.
Marquette,	J. Ellis,	—	66.3	0.14
Minden,	Joel Hull,	56	—	0.15
Mission Creek,	M. K. Walker,	—	—	—
Nebraska City,	J. B. Parmalee,	54.8	—	2.18
Stockham,	J. W. Gray,	—	—	0.20
Stromsburg,	S. S. Kauffman,	56.7	—	0.33
Syracuse,	P. W. Risser,	58.1	—	2.06
Weeping Water,	G. Treat,	50	—	1.27
West Hill,	J. L. Truman,	56.1	—	1.52
York,	D. P. Nicholson,	—	66.4	0.40

NORTH-EAST SECTION.

West Point,	E. G. Bruner,	—	69.5	0.70
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NORTH MIDDLE.

Purdum,	T. C. Jackson,	—	—	—
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SOUTH MIDDLE.

North Platte,	J. Fitzgerald,	54.2	—	0.59
Ogallala,	Dr. L. M. Line,	54.2	—	—
Red Willow,	Mrs. R. Buck,	—	—	—

WEST SECTION.

Hay Springs,	Wm. Waterman,	47.2	—	0.37
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WIND.

The following are the highest and average velocities per hour and the total number of miles traveled by the wind during the month:

	GR. VEL.	MEAN.	MILES.
Crete.....	42	11.7	8668
Omaha.....	30	7.5	5098
North Platte.....	60	8.9	6662
Lincoln.....	40	—	—

BAROMETER.

	HIGHEST.	LOWEST.	MEAN.
Crete.....	30.766	29.528	30.081
Omaha.....	30.666	29.563	30.124
North Platte.....	30.652	29.593	30.050
Lincoln.....	30.620	29.490	30.000

The following are the highest and lowest temperatures by self-regulating thermometers, and the mean humidity of the air:

	H.	L.	HUM.
Crete.....	87	20.6	76.3
Omaha.....	85.2	15.9	64.9
North Platte.....	77.3	25.6	67.6
Hay Springs.....	83	23	—
Lincoln.....	84	22	69.7

WEATHER SIGNALS.

During the month weather predictions have been telegraphed to the following points, and weather signals displayed. The table shows the total number of predictions and how many of them have failed, both in respect to temperature and to weather:

STATION.	FLAGSMAN.	PRED'NS.	FAILURES.	
			Tem.	Wea.
Crete,	C. E. Chadsey,	30	9	8
Nebraska City,	J. B. Parmalee,	30	16	6
Lincoln,	Albert Watkins,	—	—	—
Stromsburg,	S. S. Kauffman,	28	4	5
Juniata,	S. L. Brass,	31	1	1
Louisville,	Thomas Shryock,	31	4	3
Columbus,	E. C. Brake,	—	—	—
Grand Island,	C. L. Howell,	30	7	2
Beatrice,	W. A. Wagner,	—	—	—
Ashland,	T. J. Pickett, Jr.,	—	—	—
York,	F. L. Wheedon,	—	—	—
Fairbury,	W. W. Watson,	29	1	3
Falls City,	A. Minnick,	30	5	5

This gives as the per cent of correct predictions for the state:

Temperature	80
Weather.....	86.2
Mean.....	83.1

PRECIPITATION.

The average rain for the different sections of the state for October, 1886, is as follows:

	Inches.
Northeast section (one station).....	0.70
North middle (no station).....	—
West (one station).....	0.37
South middle (two stations)	0.59
Southeast (covering essentially what has heretofore been the "whole state" as far as reporting).....	1.25
State average by sections	0.73

COMPARISON OF PAST OCTOBERS.

The table shows the mean temperature, the noon temperature, and the number of days above 85° for the past nine Octobers in south-eastern Nebraska; they are found by averaging the numbers reported

at the different stations. It also shows the highest temperature and the lowest temperature recorded anywhere in the state by standard, self-registering thermometers:

Oct.	Mean Temp.	Noon Temp.	Above 85°.	Highest Temp.	Lowest Temp.
1878	50.2	62.3	0	81	15
1879	60.7	71.7	0	91	20
1880	48.9	59.5	0.2	82	23
1881	52.8	61.2	1	90	26
1882	54.9	65.6	0	83	31
1883	48.6	54	0	81.2	26
1884	55.9	65.4	1.2	86	26
1885	48.7	59.7	0.2	82.5	23
1886	56.4	65.2	0.6	87	15.9

The following table shows the precipitation or depth in inches of rain or melted snow or hail, the number of days on which it fell, and the number of cloudy and of clear days. Days are counted cloudy when the sky is four-fifths overcast; clear when less than one-third. The last column shows the number of thunder storms:

Oct.	Precipitation.	Days of precip.	Cloudy days.	Clear days.	Thunder.
1878	0.47	1.8	6	15.3	—
1879	1.58	3.2	2.9	19.5	1.5
1880	2.06	4.2	8.1	14.5	1.6
1881	3.62	8.7	12.7	9.6	2.6
1882	2.79	6.4	5.4	12.4	2.7
1883	4.58	9.4	12.8	8.8	1.5
1884	2.36	5.9	5	17.6	1.8
1885	2.35	5.1	4.4	17.5	1.2
1886	1.25	3.6	3.8	18.3	1.2

NOVEMBER.

WEATHER REPORT.

The month of November was chiefly remarkable for the early occurrence of severe weather. Since 1880 the thermometer has not been reported below zero in November. The lowest temperature of the month came with the blizzard which developed in Indian Territory on the 16th, and moved northeastward toward Lake Michigan, increasing in severity and intensity, causing violent and dangerous winds over the upper lakes on the 17th and 18th.

This was the most dangerous and destructive storm of the present season, and although ample and timely warning was given by the display of storm signals on the lakes, a loss of life, as reported, of about forty mariners occurred on the upper lakes. Its severity was due to the development at the same time of a high barometer area in the north, causing heavy winds to blow towards the storm center in Indian Territory. This cold wave moved southward from Manitoba on the 16th, reducing the temperatures below the freezing point in the Mississippi Valley as far south as Vicksburg, Miss., on the morning of the 18th, with the temperatures below zero in Dakota, Nebraska, and Colorado. A second of less severity moved southward from Manitoba on the morning of the 22d reducing the temperatures below the freezing point as far south as Arkansas, and then moved rapidly eastward and northward. The third and most severe appeared in Manitoba and northern Dakota on the afternoon of November 30th, with the temperature below zero as far south as Nebraska.

The range of temperature has been great, the highest being higher than for many Novembers past and the lowest being lower than any since 1880. The mean temperature of the month has been slightly below the normal and the precipitation somewhat above; almost the whole of it, however, fell in the form of snow during the one severe storm already mentioned. No such depth of snow has ever fallen in November heretofore since this service was organized.

ASTRONOMICAL REPORT.

The comet referred to in the last bulletin has increased gradually in brightness; early in the month it became barely visible to the naked eye, with two faint tails, one about as long as the moon's diameter, the other four or five times as long; the comet is in the constellation Virgo.

Two new asteroids were discovered by Dr. Palisa, Nov. 3, each of the twelfth magnitude. This makes the total number now known 263. It should be borne in mind by teachers that the number of these minor planets known is a constantly increasing one and it is never safe to state the exact number unless one has consulted the latest scientific periodicals.

TABLES.

The following are the mean temperatures, noon temperatures, and precipitations reported by various observers:

SOUTH-EAST SECTION.

STATION.	OBSERVER.	MEAN.	NOON.	PRE.
Crete,	C. E. Chadsey,	32.9	—	0.50
Omaha,	A. Pollock,	34.3	—	1.54
Ashland,	Geo. Shedd,	—	—	1.00
Ravenna,	E. Smith,	—	49.2	1.40
Central City,	C. Shieldstream,	30.6	—	1.00
Dawson,	M. L. Libbie,	39.2	—	1.05
De Soto,	Chas. Seltz,	33.3	—	1.70
De Witt,	F. C. Ware,	—	44	0.90
Fairbury,	Dr. Humphrey,	—	—	—
Falls City,	A. B. Newkirk,	37.7	44.5	1.30
Fremont,	I. E. Heaton.	31.6	—	1.92
Harvard,	M. F. Wistrom,	—	—	—
Lincoln,	J. G. White,	34.9	—	—
Marquette,	J. Ellis,	—	41.8	0.79
Minden,	Joel Hull,	32.9	—	2.30
Mission Creek,	M. K. Walker,	—	—	—
Nebraska City,	J. B. Parmalee,	33.3	—	0.97
Stockham,	J. W. Gray,	—	45.2	1.10
Stromsburg,	S. S. Kauffman,	32.9	—	1.14
Syracuse,	P. W. Risser,	35.1	—	1.51
Weeping Water,	G. Treat,	35.2	—	1.36
West Hill,	J. L. Truman,	30.4	—	2.06
York,	D. P. Nicholson,	—	44.2	—

NORTH-EAST SECTION.

West Point,	E. G. Bruner,	—	—	—
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NORTH MIDDLE.

Purdum,	T. C. Jackson,	—	—	—
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SOUTH MIDDLE.

North Platte,	J. Fitzgerald,	31.9	—	0.43
Ogallala,	Dr. L. M. Line,	30.8	—	—
Red Willow,	Mrs. R. Buck,	—	—	—

WEST SECTION.

Hay Springs,	Wm. Waterman,	26.3	—	2.19
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WIND.

The following are the highest and average velocities per hour and the total number of miles traveled by the wind during the month:

	GR. VEL.	MEAN.	MILES.
Crete	54	—	—
Omaha	37	10	7210
North Platte	40	9.6	6907
Lincoln	60	—	—

BAROMETER.

	HIGHEST.	LOWEST.	MEAN.
Crete.....	30.596	29.428	30.129
Omaha	30.495	29.419	30.052
North Platte.....	30.566	29.371	30.101
Lincoln.....	30.500	29.330	30.020

The following are the highest and lowest temperatures by self-regulating thermometers, and the mean humidity of the air :

	H.	L.	HUM.
Crete.....	74.1	6.0	74.4
Omaha	73.1	9.1	67.4
North Platte.....	66.1	0.5	76
Hay Springs.....	54.0	0.5	—
Lincoln	74.5	8.0	74.4

WEATHER SIGNALS.

During the month weather predictions have been telegraphed to the following points and weather signals displayed. The table shows the total number of predictions and how many of them have failed, both in respect to temperature and to weather :

STATION.	FLAGSMAN.	PRED'NS.	FAILURES.	
			Tem.	Wea.
Crete,	C. E. Chadsey,	28	12	8
Nebraska City,	J. B. Parmalee,	30	15	7
Lincoln,	Albert Watkins,	—	—	—
Stromsburg,	S. S. Kauffman,	24	10	2
Juniata,	S. L. Brass,	30	3	1
Louisville,	Thos. Shryock,	30	4	4
Columbus,	E. C. Brake,	30	15	20
Grand Island,	C. L. Howell,	30	5	5
Beatrice,	W. A. Wagner,	—	—	—
Ashland,	T. J. Pickett, Jr.	—	—	—
York,	F. L. Wheedon,	—	—	—
Fairbury,	W. W. Watson,	30	7	7
Falls City,	A. Minnick,	30	1	5

This gives as the per cent of correct predictions for the state:

Temperature	72.2
Weather	78.3
Mean.....	75.2

PRECIPITATION.

The average rain for the different sections of the state for November, 1886, is as follows:

	Inches.
N. E. Section (one station).....	—
North Middle (no station).....	—
West (one station)	2.19
South Middle (two stations)	0.43
S. E. (covering essentially what has heretofore been the "whole state" as far as reporting.....	1.26
State average by sections.....	1.29

COMPARISON OF PAST NOVEMBERS.

The table shows the mean temperature, the noon temperature, and the number of days below 32° for the past nine Novembers in south-eastern Nebraska; they are found by averaging the numbers reported at the different stations. It also shows the highest temperature and the lowest recorded anywhere in the state by standard, self-registering thermometers :

Nov.	Mean Temp.	Noon Temp.	Below 32°.	Highest Temp.	Lowest Temp.
1878	40.8	53.6	18.4	—	—
1879	38.6	46.4	15.8	65.0	8
1880	25.3	34.6	24.2	66.0	-7
1881	34.2	40.6	18.2	64.0	3
1882	38.3	46.2	20.7	73.8	2
1883	37.8	46.9	20.1	67.0	6
1884	37.2	46.6	21.3	69.2	1.9
1885	38.1	47.2	20.4	72.2	18.6
1886	33.8	43.3	24.3	74.5	-5

The following table shows the precipitation or depth in inches of rain and melted snow or hail, the number of days on which it fell, and the number of cloudy and of clear days. Days are counted cloudy when the sky is four-fifths overcast; clear when less than one-third. The last column shows the depth of snow fall during the month:

Nov.	Precipitation.	Days of precip.	Cloudy days.	Clear days.	Thunder.
1878	0.73	1.6	3.1	16.3	—
1879	2.63	4.7	6.7	14.6	—
1880	0.70	4.0	4.1	15.9	3.1
1881	1.26	3.3	5.3	12.5	5.6

Nov.	Precipitation.	Days of Precip.	Cloudy Days.	Clear Days.	Thunder.
1882	0.82	2.8	3.1	15.7	0.6
1883	0.26	1.2	2.6	19.5	—
1884	0.17	2.2	5.6	10.8	0.7
1885	1.09	2.3	7.3	13.8	0.4
1886	1.26	4.5	6.8	16.2	10.5

DECEMBER.

The month has been one of unusual cold, the mean temperature of the month being more than five degrees below the normal, although the lowest point reached by the thermometer was not unusually low.

Four well defined cold waves have passed during the month, generally originating in Manitoba and extended south almost or quite to the gulf.

The first decided cold wave of the month appeared on the 1st. It advanced rapidly from Manitoba and extended southward, and by the 4th covered the entire region east of the Rocky mountains and extended to the gulf coast, with temperature below freezing point in all districts except Florida. On the 5th freezing weather set in over eastern and western Florida and continued until the 7th. Timely warning was given of the advance of this cold wave in all districts well in advance of its appearance. The second well defined cold wave advanced southward from Manitoba on the 14th, and caused freezing weather on the 15th in the Missouri valley as far south as Nebraska. On the 16th it extended to the gulf coast, with freezing weather as far south as Florida. A third cold wave advanced from Manitoba on the 19th, passing more to the east, but reducing the temperature nearly to zero in parts of Nebraska. On the 22d a fourth well-defined cold wave from Manitoba advanced southward and produced freezing weather on the 23d in Nebraska. It extended slowly southward and continued until the close of the month.

TABLES.

The following are the mean temperatures, noon temperatures, and precipitations reported by various observers:

SOUTH-EAST SECTION.				
STATION.	OBSERVER.	MEAN.	NOON.	PRE.
Crete,	C. E. Chadsey,	18.0	—	0.57
Omaha,	A. Pollock,	—	—	—
Ashland,	Geo. Shedd,	—	—	—
Ravenna,	E. Smith,	—	26.6	0.93
Central City,	C. Shieldstream,	17.7	—	1.10
Dawson,	M. L. Libbee,	22.2	—	0.96
De Soto,	Chas. Seltz,	16.5	—	1.58
De Witt,	F. C. Ware,	—	24.0	0.53
Fairbury,	Dr. Humphrey,	—	—	—
Falls City,	A. B. Newkirk,	19.7	—	0.86
Fremont,	I. E. Heaton,	18.2	—	1.63
Harvard,	M. F. Wistrom,	—	—	—
Lincoln,	J. G. White,	—	—	—
Marquette,	J. Ellis,	—	24.8	1.13
Minden,	Joel Hull,	21.9	27.4	0.91
Mission Creek,	M. K. Walker,	—	—	—
Nebraska City,	J. B. Parmalee,	16.3	—	0.92
Stockham,	J. W. Gray,	—	—	0.45
Stromsburg,	S. S. Kauffman,	17.8	—	1.12
Syracuse,	P. W. Risser,	19.3	—	0.77
Tamora,	J. S. Williams,	16.9	—	0.52
Weeping Water,	G. Treat,	19.7	—	1.23
West Hill,	J. L. Truman,	15.0	—	0.66
York,	D. P. Nicholson,	—	28.2	—
NORTH-EAST SECTION.				
West Point,	E. G. Bruner,	—	22.2	0.50
Creighton,	Geo. Roberts,	14.1	—	—
NORTH MIDDLE.				
Purdum,	T. J. Jackson,	—	—	—
SOUTH MIDDLE.				
North Platte,	J. Fitzgerald,	23.2	—	0.40
Ogallala,	Dr. L. M. Cline,	25.6	—	—
Red Willow,	Mrs. R. Buck,	—	—	—
WEST SECTION.				
Hay Springs,	Wm. Waterman,	19.9	—	0.60
WIND.				

The following are the highest and lowest temperatures by self-regulating thermometers, and the mean humidity of the air:

	H.	L.	Hum.
Crete	56.8	11.5	—
Omaha.....	—	—	—
North Platte	57	-6.8	79.3
Hay Springs.....	50	-13	—
Lincoln	—	—	—

WEATHER SIGNALS.

During the month weather predictions have been telegraphed to the following points and weather signals displayed. The table shows the total number of predictions and how many of them have failed, both in respect to temperature and to weather:

STATION.	FLAGSMAN.	PRED'NS.	FAILURES.	
			Tem.	Wea.
Crete,	C. E. Chadsey,	31	6	14
Nebraska City,	J. B. Parmalee,	—	—	—
Lincoln,	Albert Watkins,	31	9	6
Stromsburg,	S. S. Kauffman,	29	3	1
Juniata,	S. L. Brass,	31	3	4
Louisville,	Thos. Shryock,	30	1	20
Columbus,	E. C. Brake,	30	3	2
Grand Island,	C. L. Howell,	—	—	—
Beatrice,	W. A. Wagner,	—	—	—
Ashland,	T. J. Pickett, Jr.,	—	—	—
York,	F. L. Wheedon,	—	—	—
Fairbury,	W. W. Watson,	—	—	—
Falls City,	A. Minnick,	—	—	—

This gives as the per cent of correct predictions for the state:

Temperature.....	84.3
Weather.....	82.3
Mean.....	83.3

PRECIPITATION.

The average rain for the different sections of the state for December, 1886, is as follows.

	Inches.
N. E. Section (one station).....	0.50
North Middle (one station).....	—
West (one station).....	0.60
South Middle (two stations).....	0.40
S. E. (covering essentially what has heretofore been the "whole state" as far as reporting.....	0.90
State average by sections.....	0.60

COMPARISON OF PAST DECEMBERS.

The table shows the mean temperature, the noon temperature, and the number of days below zero for the past nine Decembers in south-eastern Nebraska; they are found by averaging the numbers reported

at the different stations. It also shows the highest temperature and the lowest recorded anywhere in the state by standard, self-registering thermometers:

Dec.	Mean Temp.	Noon Temp.	Below zero.	Highest Temp.	Lowest Temp.
1878	20.5	29.0	3.7	52	- 8
1879	16.5	24.6	6.0	54	-17
1880	18.3	25.4	7.6	58	-26
1881	33.2	40.1	0.2	97	-49
1882	24.8	32.4	5.3	57	- 4.8
1883	27.7	35.6	2.1	58	- 8.6
1884	16.0	21.6	11.2	65	-18.0
1885	28.3	37.2	2.3	66	- 9.2
1886	18.0	27.8	8.8	57	-11.5

The following table shows the precipitation, or depth in inches, of rain and melted snow or hail, the number of days on which it fell, and the number of cloudy and of clear days. Days are counted cloudy when the sky is four-fifths overcast; clear when less than one-third. The last column shows the depth of snow fall during the month:

Dec.	Precipi- tation.	Days of Precip.	Cloudy Days.	Clear Days.	Snow.
1878	0.44	2.9	4.2	13.2	4.7
1879	0.91	3.2	7.7	13.1	2.4
1880	0.55	3.7	14.0	11.1	3.3
1881	0.90	3.4	6.9	11.2	4.8
1882	1.01	5.4	8.2	9.4	5.9
1883	0.71	8.4	7.5	12.7	1.3
1884	0.86	9.7	11.0	7.9	8.2
1885	1.19	4.4	8.0	14.4	4.4
1886	0.90	6.5	9.0	9.5	7.2

SIGNAL SERVICE REPORTS, 1886.

WAR DEPARTMENT, SIGNAL SERVICE U. S. A.
DIVISION OF TELEGRAMS AND REPORTS FOR BENEFIT OF COMMERCE AND AGRICULTURE.
STATION: OMAHA, NEBRASKA.

METEOROLOGICAL SUMMARY, JANUARY, 1886.

DATE	MEAN BAROM- ETER	TEMPERATURE			Precipita- tion in inches and hun- dredths	SUMMARY
		Mean	Maxim.	Minim.		
1.....	30.117	28.5	36.0	23.6	.01	Mean bar., 30.200.
2.....	30.047	19.8	25.1	18.0	.10	Highest bar., 30.669; date, 11th.
3.....	29.742	19.5	24.1	15.9	.03	Lowest bar., 29.6.2; date, 30th.
4.....	29.928	19.4	27.5	15.7	.02	Monthly range of bar., 1.047.
5.....	30.257	15.6	25.0	8.3	0	Mean temp., 7.3.
6.....	30.07	17.8	28.1	9.2	0	Highest temp., 41.8; date, 30th.
7.....	30.355	- 9.8	18.5	15.0	.04	Lowest temp., - 4.1; date, 9th.
8.....	30.427	-18.5	-12.4	-22.6	.01	Monthly range of temp., 65.9
9.....	30.550	-15.9	- 9.0	-24.1	0	Greatest daily range of temp., 33.5.
10.....	30.602	-12.9	- 9.2	-19.8	0	Least daily range of temp., 7.1.
11.....	30.648	- 7.1	2.1	-16.1	0	Mean daily range of temp., 17.4.
12.....	30.323	6.3	20.8	- 6.9	0	
13.....	30.194	17.7	29.0	4.5	0	COMPARATIVE MEAN TEMPERATURE.
14.....	30.9	26.1	31.8	18.8	.11	1871..... 24.0 | 1878..... 28.8
15.....	30.116	17.5	37.1	6.4	.03	1872..... 19. | 1879..... 21.7
16.....	30.287	1.3	10.1	- 2.0	0	1873..... 16.9 | 1880..... 34.5
17.....	30.263	- 0.5	6.0	- 4.2	.04	1874..... 22.2 | 1881..... 11.8
18.....	30.182	0.5	6.2	- 6.4	.6	1875..... 10.8 | 1882..... 27.5
19.....	30.341	- 5.7	1.5	-14.5	0	1 76..... -6.7 | 1883..... 11.9
20.....	30.163	3.5	11.6	- 3.5	.01	1877..... 20.2 | 1884..... 12.2
21.....	30.111	- 0.7	13.4	- 8.0	—	
22.....	30.554	-13.4	- 2.0	-17.2	.01	Mean daily dew point, 3.2
23.....	30.410	- 5.1	1.2	-13.6	.04	Mean daily relative humidity, 82.0.
24.....	29.978	11.4	19.8	- 4.4	0	Prevailing direction of wind, N.W.
25.....	30.024	11.4	26.4	13.5	—	Total movement of wind, 8,749
26.....	30.141	17.7	27.1	13.4	.33	miles.
27.....	30.201	11.7	18.4	0.9	—	Highest velocity of wind and di-
28.....	30.176	16.2	36.0	5.3	0	rection, 38. N.W.
29.....	30.120	11.2	18.5	- 8.9	0	Total precipitation, 1.15.
30.....	29.812	24.5	41.8	13.9	—	No. days on which .01 in. or more
31.....	30.166	9.5	16.9	2.7	.07	rain or snow fell, 14.

NOTES: Barometer reduced to sea level and standard gravity. The dash (—) indicates precipitation inappreciable.

COMPARATIVE PRECIPITATIONS.

Inches.	Inches.
1871.....0.60	1878.....1.13
1872.....0.08	1879.....0.07
1873.....0.64	1880.....0.90
1874.....0.32	1881.....0.61
1875.....0.26	1882.....0.74
1876.....0.22	1883.....1.01
1877.....0.3	1884.....0.41

No. of foggy days, 0.
No. of clear days, 8.
No. of fair days, 16.
No. of cloudy days, 7.
Dates of auroras, 0.
Dates of solar halos, 0.
Dates of lunar halos, 15.
Dates of frosts: Light, 6th, 10th,
11th, 12th, 13th, 19th, 25th, 29th,
31st; killing, 28th.
Dates of thunderstorms, 0.

ALEXANDER POLLOCK,
Observer Signal Corps, U. S. Army.

FEBRUARY, 1886.

DATE	MEAN BAROM- ETER	TEMPERATURE			Precipita- tion in inches and hun- dredths	SUMMARY
		Mean	Maxim.	Minim.		
1.....	30.340	5.6	13.0	-1.8	0	Mean bar. 30.134.
2.....	30.540	-11.3	6.2	17.7	0	Highest bar., 30.591.
3.....	30.571	-6.3	2.0	-10.4	.07	Lowest bar., 29.36; date, 9th.
4.....	30.593	-6.1	1.9	-19.4	0	Monthly range of bar., 1.158.
5.....	30.278	14.7	14.2	1.6	0	Mean temp., 24.4.
6.....	30.387	37.1	46.1	14.9	0	Highest temp., 64.3; date, 24th.
7.....	30.046	37.4	47.5	26.9	0	Lowest temp., -19.4; date, 4th.
8.....	29.653	36.8	48.0	27.3	0	Monthly range of temp., 83.7.
9.....	29.570	32.5	43.9	30.4	.03	Greatest daily range of temp., 38.4;
10.....	29.911	20.2	40.2	16.8	.08	date, 24th.
11.....	30.180	19.2	28.8	10.3	0	Least daily range of temp., 10.3;
12.....	29.980	29.2	42.2	13.3	0	date, 28th.
13.....	29.699	34.8	44.4	33.3	0	Mean daily range of temp., 23.9;
14.....	30.143	28.8	45.4	16.0	—	
15.....	30.473	11.4	26.0	7.5	—	
16.....	30.343	15.2	42.0	8.6	0	COMPARATIVE MEAN TEMPERATURE.
17.....	30.051	37.4	48.0	27.2	0	1871.....30.3 | 1879.....26.8
18.....	20.939	36.7	48.6	27.9	0	1872.....27.5 | 1880.....30.9
19.....	30.408	16.8	30.5	10.2	—	1873.....28.4 | 1881.....17.9
20.....	30.125	31.1	48.0	9.6	0	1874.....23.0 | 1882.....36.3
21.....	30.209	29.6	44.5	23.0	0	1875.....26.7 | 1883.....21.7
22.....	30.119	4.7	52.5	29.1	0	1876.....30.4 | 1884.....19.4
23.....	30.249	40.4	49.7	15.0	0	1877.....7.3 | 1885.....16.6
24.....	29.815	41.4	64.3	25.9	0	1878.....36.7
25.....	30.190	18.8	44.0	18.0	0	
26.....	30.065	29.8	47.3	15.9	0	Mean daily dew point, 18.3.
27.....	29.853	28.9	43.4	26.0	.14	Mean daily relative humidity, 78.3.
28.....	30.169	25.9	33.9	23.6	.04	Prevailing direction of wind, N.W.

NOTES: Barometer reduced to sea level and standard gravity. The dash (—) indicates precipitation inappreciable.

Total movement of wind, 5,831 miles.
Highest velocity of wind and direction, 34, N.W.; date, 24th.
Total precipitation, 0.36.
No. days on which .01 in. or more rain or snow fell, 6.
Depth unmelted snow on ground at end of month, 2 inches.

COMPARATIVE PRECIPITATIONS.

Inches.	Inches.
1871.....1.76	1879.....0.93
1872.....0.43	1880.....0.14
1873.....0.02	1881.....3.09
1874.....0.92	1882.....0.60
1875.....0.51	1883.....1.09
1876.....0.40	1884.....1.42
1877.....0.44	1885.....0.47
1878.....0.14	

No. of foggy days, 0.
No. of clear days, 16.
No. of fair days, 9.
No. of cloudy days, 3.
Dates of Auroras, 0.
Dates of solar halos, 0.
Dates of lunar halos, 10th, 12th.
Dates of frosts: Light, 1st, 4th, 7th, 12th, 14th, 17th, 20th, 23d; killing, 16th.
Dates of thunderstorms, 0.

ALEXANDER POLLOCK,
Observer Signal Corps, U. S. Army.

MARCH, 1886.

DATE	MEAN BAROM- ETER	TEMPERATURE			Precipita- tions in inches and hundredths	SUMMARY
		Mean	Maxim.	Minim.		
1.....	30.429	22.1	32.0	19.6	—	Mean barometer, 30.052
2.....	30.476	22.8	31.5	18.4	0	Highest bar., 30.535; date 2d.
3.....	30.347	24.8	31.4	17.1	—	Lowest bar., 29.508; date 14th.
4.....	30.129	27.8	35.5	23.6	.32	Monthly range of bar., 1.027.
5.....	30.173	29.1	34.5	27.5	.24	Mean temperature, 31.9
6.....	30.280	30.3	40.8	25.5	.02	Highest tem., 63.6; date 24th.
7.....	30.082	31.3	41.6	26.9	—	Lowest temp., -1.4; date 9th.
8.....	30.167	19.6	33.0	10.4	0	Monthly range of temp., 65.0.
9.....	30.348	7.4	17.9	1.4	0	Greatest daily range of temp., 33.6
10.....	30.087	21.2	35.0	1.8	0	Least daily range of temp., 7.0.
11.....	29.736	32.5	40.8	29.4	.24	Mean daily range of temp., 18.6.
12.....	29.823	25.3	42.0	11.9	0	
13.....	29.614	31.9	46.0	12.4	.5	
14.....	29.689	35.1	44.6	30.5	.02	COMPARATIVE MEAN TEMPERATURE.
15.....	30.028	32.1	40.2	29.4	—	1871.....40.8 | 1879.....41.0
16.....	30.034	43.6	54.7	29.4	0	1872.....31.2 | 1880.....35.9
17.....	29.911	45.6	63.0	37.0	0	1873.....38.1 | 1881.....27.6
18.....	29.823	39.6	49.6	34.3	0	1874.....33.5 | 1882.....40.2
19.....	29.650	36.5	46.0	34.3	—	1875.....30.3 | 1883.....34.6
20.....	29.700	31.7	42.2	31.3	—	1876.....29.2 | 1884.....35.3
21.....	30.070	38.5	50.8	29.9	.18	1877.....33.6 | 1885.....36.1
22.....	30.187	43.5	56.7	32.3	0	1878.....47.9
23.....	30.120	45.7	59.9	31.3	0	Mean daily dew point, 26.0
24.....	29.913	49.4	63.6	41.1	0	Mean daily relative humidity, 80.4
25.....	30.258	43.9	54.7	39.2	0	Prevailing direction of wind, NW.
26.....	30.151	42.1	56.1	33.6	0	Total movmt. of wind, 64.9 miles.
27.....	30.248	29.1	46.6	27.6	0	Highest velocity of wind and di- rection, 36. N.
28.....	30.067	28.8	35.6	25.1	.03	Total precipitation, 1.31.
29.....	30.207	24.1	36.4	21.6	.28	Number of days on which .01 in., or more of rain or snow fell, 7.
30.....	30.068	24.8	34.0	18.4	0	Depth unmelted snow on ground at end of month, 0.5 inch.
31.....	29.841	29.3	43.1	14.8	0	

NOTES: Barometer reduced to sea level and standard gravity. The dash (—) indicates precipitation inappreciable.

COMPARATIVE PRECIPITATIONS.	
Inches.	Inches.
1871.....0.18	1879.....2.17
1872.....1.62	1880.....0.50
1873.....0.44	1881.....0.12
1874.....1.49	1882.....0.79
1875.....1.24	1883.....0.52
1876.....3.18	1884.....4.91
1877.....1.26	1885.....0.33
1878.....3.09	

Number of foggy days, 0.
No. of clear days, 8.
No. of fair days, 12.
No. of cloudy days, 11.
Dates of auroras, 0.
Dates of solar halos, 0.
Dates of lunar halos, 0.
Dates of frosts: Light, 10, 22; killing, 16.
Dates of thunderstorms, 0.

ALEXANDER POLLOCK,
Observer Signal Corps, U. S. A.

APRIL, 1886.

DATE	MEAN BAROM- ETER	TEMPERATURE			Precipita- tions in inches and hundredths	SUMMARY
		Mean	Maxim.	Min'm.		
1.....	30.109	21.8	40.2	18.1	0	Mean barometer, 29.989.
2.....	30.203	25.7	36.1	17.8	0	Highest bar., 30.407; date 5th.
3.....	30.248	30.1	36.1	26.0	0	Lowest bar., 29.477; date 25th.
4.....	30.363	30.6	44.4	24.6	0	Monthly range of bar., .930.
5.....	30.381	32.9	48.6	24.9	0	Mean temp., 50.9.
6.....	30.278	30.8	53.6	28.9	0	Highest temp., 84.6; date 22d.
7.....	30.108	47.6	62.0	29.4	0	Lowest temp., 17.8; date 2d.
8.....	29.980	57.7	70.3	45.0	—	Monthly range of temp., 66.8.
9.....	29.922	55.4	63.2	48.3	.16	Greatest daily range of temp., 32.6.
10.....	30.032	51.6	64.0	48.1	.01	Least daily range of temp., 10.1.
11.....	30.052	49.1	57.7	43.7	0	Mean daily range of temp., 22.3.
12.....	29.962	54.2	61.5	45.0	—	
13.....	29.749	61.0	73.1	52.5	.25	COMPARATIVE MEAN TEMPERATURE.
14.....	29.619	67.0	81.1	56.9	.02	
15.....	29.719	61.2	75.0	49.5	0	1871.....53.7 1879.....53.6
16.....	29.839	52.0	63.8	49.1	.18	1872.....48.4 1880.....51.2
17.....	30.070	60.3	75.1	44.6	0	1873.....45.3 1881.....44.4
18.....	30.168	61.8	74.0	53.0	0	1874.....44.7 1882.....52.0
19.....	30.341	65.1	77.0	51.1	0	1875.....44.9 1883.....53.6
20.....	30.298	66.5	79.8	52.2	0	1876.....1.1 1884.....47.5
21.....	30.094	66.7	79.2	55.6	0	1877.....50.1 1885.....50.1
22.....	29.876	69.4	84.6	59.3	.02	1878.....54.6
23.....	29.903	55.6	71.4	49.2	0	
24.....	29.914	52.3	66.8	40.6	0	Mean daily dew point, 39.7.
25.....	29.627	58.9	68.2	50.1	.18	Mean daily relative humidity, 68.7
26.....	29.632	42.9	61.1	39.0	.09	Prevailing direction of wind, S. E.
27.....	29.735	51.1	63.9	37.5	—	Total movmt. of wind, 6,331 miles.
28.....	29.615	47.5	67.3	38.2	.12	Highest velocity of wind and
29.....	29.816	36.0	57.0	33.3	.74	direction, 34; N. W.
30.....	30.032	52.6	65.8	41.5	0	Total precipitation, 1.77.

NOTES: Barometer reduced to sea level and standard gravity. The dash (—) indicates precipitation inappreciable.

Number of days on which .01 in. or more of rain or snow fell, 10.
Depth unmelted snow on ground at end of month, 0 inches.

COMPARATIVE PRECIPITATIONS.

Inches.	Inches.
1871.....3.38	1879.....1.77
1872.....3.84	1880.....0.55
1873.....3.83	1881.....4.23
1874.....2.01	1882.....4.31
1875.....3.06	1883.....3.20
1876.....2.65	1884.....3.88
1877.....6.24	1885.....6.34
1878.....3.97	

Number of foggy days, 0.
No. of clear days, 9.
No. of fair days, 15.
No. of cloudy days, 6.
Dates of auroras, 0.
Dates of solar halos, 0.
Dates of lunar halos, 16.
Dates of frosts: Light, 5th, 7th; killing, 0.
Dates of thunderstorms, 14th, 22d, 25th.

ALEXANDER POLLOCK,
Sergeant Signal Corps, U. S. Army.

MAY, 1886.

DATE	MEAN BAROM- ETER	TEMPERATURE			Precipita- tion in inches and hundredths	SUMMARY
		Mean	Maxim.	Minim.		
1.....	30.005	56.5	69.6	44.0	.28	Mean barometer, 29.943.
2.....	30.149	52.1	69.2	50.1	.94	Highest bar., 30.243; date, 16th.
3.....	29.917	58.0	69.5	49.2	.15	Lowest bar., 29.536; date, 9th.
4.....	29.985	54.8	62.2	50.3	.01	Monthly range of bar., 0.718.
5.....	29.936	61.6	74.0	46.0	.02	Mean temp., 66.1.
6.....	30.021	57.7	79.0	53.1	0	Highest temp., 92.9; date, 21st.
7.....	30.001	61.1	73.8	45.5	0	Lowest temp., 41.0; date, 16.
8.....	29.691	72.7	82.8	59.0	0	Monthly range of temp., 51.9.
9.....	29.591	65.2	75.2	55.3	.15	Greatest daily range of temp., 37.8
10.....	29.780	64.4	79.6	52.0	0	Least daily range of temp., 9.1.
11.....	30.796	66.2	78.5	57.6	.04	Mean daily range of temp., 23.8.
12.....	29.745	67.4	82.9	57.1	.01	
13.....	29.752	67.4	82.3	57.3	.01	
14.....	29.900	52.0	68.1	45.1	.75	COMPARATIVE MEAN TEMPERATURE.
15.....	30.070	52.8	65.0	42.4	0	1871.....75.8
16.....	30.220	55.7	69.5	41.0	0	1872.....60.9
17.....	30.135	63.3	74.5	52.5	0	1880.....64.4
18.....	30.068	66.6	80.8	52.4	0	1873.....58.8
19.....	30.095	69.7	84.8	53.7	0	1874.....66.1
20.....	29.982	75.7	91.4	53.6	0	1881.....67.8
21.....	29.858	77.3	92.9	64.2	0	1882.....66.6
22.....	29.916	74.8	88.6	62.0	—	1875.....62.9
23.....	30.041	73.5	83.9	54.4	.03	1876.....63.0
24.....	30.099	70.2	82.1	57.1	0	1883.....57.3
25.....	30.046	66.2	79.1	55.3	—	1884.....61.6
26.....	29.866	73.0	86.5	64.2	0	1877.....60.3
27.....	29.937	68.2	79.0	62.1	0	1885.....59.8
28.....	29.910	70.8	85.1	54.1	0	1878.....58.1
29.....	29.849	72.0	82.4	62.7	.55	Mean daily dew point, 51.1.
30.....	29.926	63.4	73.4	57.4	.64	Mean daily relative humidity, 64.8
31.....	29.933	68.3	79.5	55.5	—	Prevailing direction of wind, N.
						Total mov't of wind, 4,269 miles.
						Highest velocity of wind and di- rection, 29, N.
						Total precipitation, 4.58.
						No. days on which .01 inch or more of rain or snow fell, 13
						Depth unmelted snow on ground at end of month, 0.
						COMPARATIVE PRECIPITATIONS.
						Inches.
						Inches.
						1871.....2.65
						1872.....6.35
						1880.....3.40
						1873.....5.59
						1881.....7.94
						1874.....1.24
						1882.....4.91
						1875.....4.25
						1883.....11.29
						1876.....2.07
						1884.....1.45
						1877.....8.62
						1885.....4.43
						1878.....5.97
						No. of foggy days, 0.
						No. of clear days, 11.
						No. of fair days, 17.
						No. of cloudy days, 3.
						Dates of auroras, 0.
						Dates of solar halos, 0.
						Dates of lunar halos, 9, 12.
						Dates of frosts: Light, 0; killing, 0.
						Date of thunderstorms, 8, 5, 9, 12, 14, 29.

NOTES: Barometer reduced to sea level and standard gravity. The dash (—) indicates precipitation inappreciable.

ALEXANDER POLLOCK,
Observer, Signal Corps, U. S. A.

JUNE, 1886.

DATE	MEAN BAROM- ETER	TEMPERATURE			Precipita- tion in inches and hundredths	SUMMARY
		Mean	Maxim.	Minim.		
1.....	29.872	71.8	83.1	66.2	.05	Mean barometer, 29.967.
2.....	30.190	58.5	68.5	54.0	0	Highest bar., 30.338; date, 8.
3.....	30.267	61.1	72.0	47.1	0	Lowest bar., 29.685; date, 14.
4.....	30.046	66.1	76.3	54.1	0	Monthly range of bar., 0.703.
5.....	29.989	68.6	80.6	54.1	0	Mean temp., 70.2.
6.....	29.929	67.7	85.2	59.2	.12	Highest temp., 92.4; date, 14.
7.....	29.957	69.7	83.1	60.0	.39	Lowest temp., 47.1; date, 8.
8.....	29.999	78.2	85.7	65.2	0	Monthly range of temp., 45.8.
9.....	29.936	76.3	89.7	63.6	0	Greatest daily range of temp., 29.6.
10.....	29.864	77.1	92.2	62.6	0	1 cast daily range of temp., 10.0.
11.....	29.778	78.1	88.1	67.6	0	Mean daily range of temp., 21.6.
12.....	29.720	79.5	90.8	72.1	0	
13.....	29.771	79.6	66.7	91.0	0	COMPARATIVE MEAN TEMPERATURE.
14.....	29.754	77.3	92.4	64.3	.45	1871.....75.8 | 1879.....72.7
15.....	29.823	69.1	73.2	63.2	.12	1872.....78.5 | 1880.....73.0
16.....	29.847	70.4	81.9	64.2	0	1873.....74.1 | 1881.....74.9
17.....	30.045	65.9	75.1	58.6	0	1874.....78.1 | 1882.....71.0
18.....	30.007	65.0	74.2	57.1	.10	1875.....70.9 | 1883.....69.1
19.....	29.932	67.0	76.1	61.2	.11	1876.....68.2 | 1884.....72.3
20.....	29.970	71.6	82.9	62.0	C	1877.....69.1 | 1885.....71.1
21.....	29.972	72.1	84.1	63.4	.11	1878.....66.7
22.....	30.020	66.3	77.1	58.2	0	
23.....	29.992	69.1	80.1	59.1	0	Mean daily dew point, 58.6.
24.....	29.927	70.8	83.3	60.2	0	Mean daily relative humidity, 69.1
25.....	29.971	70.7	81.4	59.7	0	Prevailing direction of wind, 18.
26.....	29.898	68.7	78.8	61.0	0	Total mov't of wind, 3,964 miles.
27.....	30.018	65.9	82.1	60.6	.05	Highest velocity of wind and di- rection, 32 SE.
28.....	30.089	67.8	82.8	54.2	0	Total precipitation, 1.50
29.....	30.187	69.3	83.1	55.9	0	No. of days on which .01 inch or more of rain or snow fell, 9.
30.....	30.151	72.4	88.2	58.7	0	Depth unmelted snow on ground at end of month, 0.

NOTES: Barometer reduced to sea level and standard gravity. The dash (—) indicates precipitation inappreciable.

COMPARATIVE PRECIPITATIONS.

Inches.	Inches.
1871.....2.65	1879.....4.09
1872.....3.91	1880.....3.14
1873.....5.86	1881.....5.56
1874.....6.33	1882.....12.05
1875.....10.56	1883.....12.70
1876.....3.47	1884.....6.11
1877.....3.36	1885.....2.67
1878.....3.48	

No. of foggy days, 0.
No. of clear days, 12.
No. of fair days, 16.
No. of cloudy days, 2.
Dates of auroras, 0.
Dates of solar halos, 0.
Dates of lunar halos, 0.
Dates of frosts: Light, 0; killing, 0.
Dates of thunderstorms, 6, 14, 27.

ALEXANDER POLLOCK,
Observer, Signal Corps, U. S. A.

JULY, 1886.

DATE	MEAN BAROM- ETER	TEMPERATURE			Precipita- tion in inches and hundredths	SUMMARY
		Mean	Maxim.	Minim.		
1.....	30.017	74.3	88.8	63.2	0	Mean bar., 29.943.
2.....	29.981	76.5	88.0	66.2	0	Highest bar., 30.133; date, 7th.
3.....	29.987	78.7	90.0	66.2	0	Lowest bar., 29.745; date, 28th.
4.....	29.922	82.8	94.6	71.1	0	Monthly range of bar., 0.388.
5.....	29.981	84.0	96.8	71.3	0	Mean temp., 77.8.
6.....	30.036	85.2	98.2	71.3	0	Highest temp., 100; date, 13th.
7.....	30.103	83.1	97.0	74.6	0	Lowest temp., 59.2; date, 26th.
8.....	30.081	78.1	94.0	69.6	0	Monthly range of temp., 40.8.
9.....	29.920	79.3	91.5	74.0	0	Greatest daily range of temp.,
10.....	30.048	75.5	87.0	65.2	0	80.3; date, 27th.
11.....	30.082	78.4	89.0	65.1	0	Least daily range of temp., 10.7;
12.....	29.962	82.0	95.7	66.2	0	date 15th.
13.....	29.896	84.2	100.0	71.6	0	Mean daily range of temp., 23.2.
14.....	30.027	73.5	85.0	65.2	0	COMPARATIVE MEAN TEMPERATURE.
15.....	29.925	72.9	79.3	68.6	—	1871.....75.4 | 1879.....78.7
16.....	29.968	73.4	85.0	60.4	0	1872.....76.1 | 1880.....76.5
17.....	29.961	75.8	89.5	61.6	0	1873.....74.5 | 1881.....78.9
18.....	29.903	76.1	84.6	70.6	0	1874.....79.6 | 1882.....71.7
19.....	29.869	76.4	86.6	69.6	—	1875.....74.1 | 1883.....75.6
20.....	29.935	71.4	80.5	65.9	—	1876.....75.2 | 1884.....74.5
21.....	19.947	75.4	89.6	60.2	0	1877.....75.6 | 1885.....77.0
22.....	29.970	78.3	91.3	61.1	0	1878.....79.0
23.....	19.952	77.3	85.2	70.4	—	Mean daily dew point, 60.0.
24.....	29.898	77.5	87.0	68.1	0	Mean daily relative humidity, 58.5
25.....	29.841	75.6	89.1	64.9	—	Prevailing direction of wind, S.
26.....	29.885	74.4	87.3	59.2	0	Total movement of wind, 4,012
27.....	29.851	79.5	94.0	63.7	0	miles.
28.....	29.774	78.9	95.7	66.7	0	Highest velocity of wind and di-
29.....	29.905	69.3	78.6	66.2	.69	rection, 24, N., 28th and 29th.
30.....	29.892	75.7	86.1	64.5	0	Total precipitation, 0.69.
31.....	29.873	72.6	84.1	67.3	—	Number of days on which .01

NOTES: Barometer reduced to sea level and standard gravity. The dash (—) indicates precipitation inappreciable.

Depth of unmelted snow on ground at end of month, 0 inches

COMPARATIVE PRECIPITATION.

Inches.	Inches.
1871.....9.89	1879.....3.17
1872.....6.36	1880.....5.36
1873.....4.27	1881.....5.89
1874.....0.54	1882.....6.76
1875.....10.01	1883.....4.79
1876.....7.30	1884.....10.35
1877.....0.96	1885.....9.24
1878.....7.66	

No. of foggy days, 0.

No. clear days, 18.

No. fair days, 9.

No. cloudy days, 4.

Dates of auroras, 0.

Dates of solar halos, 0.

Dates of lunar halos, 0.

Dates of frost: Light, 0; killing, 0.

Dates of thunderstorms, 25th and 29th.

ALEXANDER POLLOCK,
Observer Signal Corps, U. S. A.

AUGUST, 1886.

DATE	MEAN BAROM- ETER	TEMPERATURE			Precipita- tion in inches and hundredths	SUMMARY
		Mean	Maxim.	Minim.		
1.....	30.032	78.2	83.6	65.4	0	Mean bar., 29.950.
2.....	30.137	70.4	80.1	63.2	—	Highest bar., 30.173; date 2d.
3.....	30.077	66.6	74.1	63.2	.05	Lowest bar., 29.682; date 15th.
4.....	30.963	69.1	76.1	64.2	.04	Monthly range of bar., .491.
5.....	29.999	73.0	85.1	62.2	0	Mean temperature, 75.6.
6.....	30.081	71.7	82.6	61.1	0	Highest temp., 99.0; date 24th.
7.....	30.007	75.0	89.1	61.4	0	Lowest temp., 43.6; date 31st.
8.....	29.976	78.0	89.0	65.2	0	Monthly range of temp., 55.4.
9.....	29.991	74.7	85.6	68.7	.98	Greatest daily range of temp.,
10.....	29.964	79.5	90.0	69.1	0	30.6.
11.....	27.880	82.9	96.5	72.1	0	Least daily range of temp., 10.9.
12.....	29.764	79.0	86.1	75.1	.59	Mean daily range of temp., 20.1.
13.....	29.723	81.1	95.0	76.1	.07	
14.....	29.796	79.6	89.6	73.6	.01	COMPARATIVE MEAN TEMPERATURE.
15.....	29.738	83.7	93.0	72.1	0	1871.....73.5 | 1878.....76.3
16.....	29.817	78.6	88.0	73.6	—	1872.....74.9 | 1879.....75.0
17.....	30.030	69.4	77.3	66.3	.77	1873.....77.2 | 1880.....74.8
18.....	30.125	72.4	83.6	61.2	0	1874.....77.2 | 1881.....80.7
19.....	29.974	77.0	86.6	67.6	—	1875.....70.0 | 1882.....73.2
20.....	29.896	88.0	97.0	72.1	0	1876.....74.9 | 1883.....71.1
21.....	29.849	82.4	92.5	76.6	.02	1877.....72.6 | 1884.....70.3
22.....	29.932	80.0	93.3	71.7	0	
23.....	29.953	79.2	93.8	64.7	0	Mean daily dew point, 62.1.
24.....	29.927	83.4	99.0	68.4	0	Mean daily relative humidity, 65.6
25.....	29.962	78.3	89.0	70.0	0	Prevailing direction of wind, S.
26.....	29.932	78.8	90.0	70.6	0	Total movement of wind, 4,318
27.....	29.911	77.2	88.0	70.1	0	miles.
28.....	29.102	67.3	77.6	65.2	0	Highest velocity of wind, and di-
29.....	29.866	73.6	87.5	65.2	0	rection, 22 miles; N.
30.....	30.042	64.0	77.1	53.1	0	Total precipitation, 2.53 inches.
31.....	30.144	60.5	73.6	43.1	0	Number of days on which .01

NOTES: Barometer reduced to sea level and standard gravity. The dash (—) indicates precipitation inappreciable.

Depth of unmelted snow on ground at end of month, 0 inches.

COMPARATIVE PRECIPITATIONS.

Inches.	Inches.
1871.....2.58	1879.....1.51
1872.....1.78	1880.....7.10
1873.....1.60	1881.....1.65
1874.....2.08	1882.....0.95
1875.....7.77	1883.....3.39
1876.....6.27	1884.....7.07
1877.....3.13	1885.....6.99
1878.....2.48	1886.....4.53

No. foggy days, 0.
No. clear days, 13.
No. fair days, 12.
No. cloudy days, 6.
Dates of auroras, 0.
Dates of solar halos, 0.
Dates of lunar halos, 8.
Dates of frosts: light 0; killing, 0
Dates of thunderstorms, 9th, 12th, 13th, 16th, 17th.

C. D. BAMY,
Signal Corps, U. S. A.

SEPTEMBER, 1886.

DATE	M AN BAROM- ETER	TEMPERATURE			Precipita- tion in inches and hun- dredths	SUMMARY
		Mean	Maxim.	Minim.		
1.....	29.961	67.8	79.6	52.1	.61	Mean bar., 29.985.
2.....	29.912	71.7	84.1	63.2	.31	Highest bar., 30.297; dates, 19th
3.....	29.895	73.1	84.7	59.2	.81	and 20th.
4.....	29.973	74.8	86.1	62.2	0	Lowest bar., 29.570; date, 15th
5.....	29.980	79.8	90.1	58.1	.36	Monthly range of bar., 0.727.
6.....	30.025	72.4	89.2	69.5	.01	Mean temp., 65.1.
7.....	30.125	70.2	84.1	64.7	.01	Highest temp., 92.7; date, 22d.
8.....	30.167	60.1	70.1	58.2	.21	Lowest temp., 39.9; date, 30th.
9.....	29.904	67.9	74.9	58.2	.20	Monthly range of temp., 52.8
10.....	30.104	63.9	72.6	57.7		Greatest daily range of temp., 33.4;
11.....	30.061	61.4	74.1	55.9	.01	date, 30th.
12.....	30.038	60.3	74.1	50.1	0	Least daily range of temp., 10.1;
13.....	29.893	66.8	82.4	53.1	.68	date, 25th.
14.....	29.802	68.0	80.2	55.9	0	Mean daily range of temp., 22.1.
15.....	29.597	71.1	81.6	59.7	.05	
16.....	29.937	64.9	74.3	51.1	.35	
17.....	30.241	56.0	69.6	45.1	0	
18.....	30.107	53.0	62.6	40.4	.01	
19.....	30.290	55.6	68.0	47.0	0	
20.....	30.177	62.1	74.1	49.1	0	
21.....	29.860	74.9	89.0	56.9	0	
22.....	29.807	79.4	92.7	67.2	.01	
23.....	29.830	77.1	90.0	68.8	.01	
24.....	29.881	73.0	84.1	67.4	.46	
25.....	29.892	62.5	72.0	61.9	.21	
26.....	29.771	67.7	82.1	56.1	.10	
27.....	30.125	53.4	67.6	51.1	0	
28.....	30.269	52.1	64.5	41.7	0	
29.....	30.027	59.7	76.1	42.1	0	
30.....	30.171	43.4	83.3	39.8	0	

NOTES: Barometer reduced to sea level and standard gravity. The dash (—) indicates precipitation inappreciable.

COMPARATIVE MEAN TEMPERATURE.

1871.....	62.2	1879.....	62.5
1872.....	62.4	1880.....	62.9
1873.....	60.4	1881.....	66.0
1874.....	62.7	1882.....	67.5
1875.....	62.5	1883.....	60.8
1876.....	62.2	1884.....	68.6
1877.....	66.4	1885.....	64.5
1878.....	61.1		

Mean daily dew point, 53.8.
Mean daily relative humid., 69.5.
Prevailing direction of wind, S.
Total movement wind, 5,534 miles.
Highest velocity of wind and di-
rection, 24, N. and N.W.
Total precipitation, 4.45.
No. days on which .01 in. or more
rain or snow fell, 18.
Depth unmelted snow on ground
at end of month, 0.

COMPARATIVE PRECIPITATIONS.

Inches.		Inches.	
1871.....	2.73	1879.....	1.43
1872.....	3.24	1880.....	2.91
1873.....	1.86	1881.....	3.36
1874.....	7.18	1882.....	0.51
1875.....	2.55	1883.....	4.53
1876.....	4.93	1884.....	7.07
1877.....	2.05	1885.....	2.50
1878.....	3.2	1886.....	44.5

No. of foggy days, 0.
No. of clear days, 8.
No. of fair days, 15.
No. of cloudy days, 7.
Dates of auroras, 0.
Dates of solar halos, 0.
Dates of lunar halos, 0.
Dates of frosts: Light, 17th; kill-
ing, 0.
Dates of thunderstorms, 2d, 3d,
5th, 13th, 15th, and 26th.

ALEXANDER POLLOCK,
Sergeant Signal Corps, U. S. Army.

OCTOBER, 1886.

DATE	MEAN BAROM- ETER	TEMPERATURE			Precipita- tion in inches and hun- dredths	SUMMARY
		Mean	Maxim.	Minim.		
1.....	30.273	48.5	62.9	31.9	0	Mean bar., 30.124.
2.....	30.219	60.7	76.5	43.6	0	Highest bar., 30.666; date, 26th.
3.....	30.203	65.3	76.7	53.8	0	Lowest bar., 29.563; date, 13th.
4.....	30.33	60.4	74.6	48.1	0	Monthly range of bar., 1.103.
5.....	30.098	62.0	75.1	49.1	0	Mean temp., 58.3.
6.....	29.990	65.5	78.6	52.1	.0	Highest temp., 85.2; date, 11th.
7.....	29.984	67.0	80.1	54.1	—	Lowest temp., 15.9; date, 27th.
8.....	30.034	68.9	78.1	61.9	.12	Monthly range of temp., 69.3.
9.....	29.996	66.7	73.1	59.2	0	Greatest daily range of temp., 36.7;
10.....	30.006	66.6	75.1	59.8	0	date, 27th.
11.....	29.965	73.8	85.2	66.2	0	Least daily range of temp., 12.2;
12.....	29.941	70.5	82.4	60.2	0	date, 4th.
13.....	29.624	67.5	81.7	58.9	.35	Mean daily range of temp., 22.6.
14.....	29.981	56.3	67.2	48.1	.01	
15.....	30.439	50.2	61.3	40.1	0	COMPARATIVE MEAN TEMPERATURE.
16.....	30.213	60.8	75.6	42.1	0	1871.....53.2 | 1879.....61.5
17.....	30.062	55.9	65.6	52.1	0	1872.....53.0 | 1880.....49.2
18.....	29.991	62.0	75.6	46.1	0	1873.....48.4 | 1881.....54.4
19.....	29.932	69.0	77.2	60.9	0	1874.....58.6 | 1882.....57.2
20.....	30.331	50.4	71.2	45.1	.03	1875.....49.6 | 1883.....49.4
21.....	30.359	54.2	69.1	39.8	0	1876.....49.9 | 1884.....57.3
22.....	29.991	59.8	64.3	50.6	.63	1877.....51.2 | 1885.....42.8
23.....	29.740	60.8	69.6	53.1	.19	1878.....52.0 | 1886.....58.3
24.....	30.252	48.4	55.3	43.1	0	
25.....	30.584	37.6	47.0	31.3	0	Mean daily dew point, 45.0.
26.....	30.596	37.8	48.0	29.8	0	Mean daily relative humid., 64.9.
27.....	30.322	39.9	52.6	15.9	0	Prevailing direction of wind, S.
28.....	30.128	45.0	58.7	29.4	0	Total movement wind, 5,598 miles.
29.....	30.139	53.0	67.0	39.2	0	Highest velocity of wind and di-
30.....	30.197	58.9	69.1	45.7	0	rection, 30.5, S; date, 19th.
31.....	29.995	64.4	76.1	56.4	0	Total precipitation, 1.33.

NOTES: Barometer reduced to sea level and standard gravity. The (—) dash indicates precipitation inappreciable.

No. days on which .01 in. or more rain or snow fell, 5.

COMPARATIVE PRECIPITATIONS.

Inches.	Inches.
1871.....2.06	1879.....3.64
1872.....3.89	1880.....3.54
1873.....1.8	1881.....4.48
1874.....1.45	1882.....3.09
1875.....1.16	1883.....5.09
1876.....0.6	1884.....5.81
1877.....5.86	1885.....3.66
1878.....0.55	1886.....1.33

No. of clear days, 13.

No. of fair days, 12.

No. of cloudy days, 6.

Dates of frosts: Light, 15th, 21st; killing, 1st, 26th, 27th, 28th.

ALEXANDER POLLOCK,
Sergeant Signal Corps, U. S. Army.

NOVEMBER, 1886.

DATE	MEAN BAROM- ETER	TEMPERATURE			Precipita- tion in inches and hundredths	SUMMARY
		Mean	Maxim.	Minim.		
1.....	29.784	64.4	78.1	59.2	0	Mean barometer, 30.052.
2.....	29.826	51.2	63.6	45.9	0	Highest bar., 30.495; date 26th.
3.....	30.158	48.2	58.0	40.8	0	Lowest bar., 29.419; date 22d.
4.....	29.966	54.7	67.0	43.1	0	Monthly range of bar., 1.076.
5.....	30.411	35.0	58.1	33.3	0	Mean temp., 34.8.
6.....	30.332	36.1	47.9	27.0	†	Highest temp., 73.1; date 1st.
7.....	30.289	33.6	47.0	23.2	†	Lowest temp., 9.1; date 25th.
8.....	29.902	42.6	55.0	31.8	0	Monthly range of temp., 64.0.
9.....	29.820	44.9	53.0	37.8	.02	Greatest daily range of temp., 30.4;
10.....	30.340	33.2	41.0	28.0	0	date 22d.
11.....	30.392	32.5	48.0	25.1	0	Least daily range of temp., 9.0;
12.....	30.374	30.0	43.0	19.4	†	date 15th.
13.....	30.263	38.8	58.0	23.6	†	Mean daily range of temp., 19.5.
14.....	30.396	40.6	52.4	31.7	0	
15.....	30.320	38.1	42.3	33.3	0	
16.....	29.864	27.7	40.4	26.0	*.91	COMPARATIVE MEAN TEMPERATURE.
17.....	29.676	17.7	26.0	15.8	*.44	1871.....30.7 1879.....40.3
18.....	30.050	18.9	27.0	11.1	*.01	1872.....30.1 1880.....26.4
19.....	29.979	27.5	40.6	17.8	0	1873.....38.2 1881.....36.9
20.....	29.960	29.8	43.0	20.2	†	1874.....36.0 1882.....39.7
21.....	29.807	33.7	42.6	21.9	†	1875.....32.6 1883.....39.2
22.....	29.484	40.5	52.8	22.4	0.01	1876.....33.1 1884.....39.3
23.....	29.803	20.1	38.0	12.7	†	1877.....35.0 1885.....39.9
24.....	30.174	14.0	21.0	9.7	†	1878.....43.8 1886.....34.3
25.....	30.153	22.0	37.8	9.1	0	
26.....	30.412	24.9	33.0	14.9	*.	Mean daily dew point, 23.0.
27.....	30.197	38.8	46.4	29.3	0	Mean daily relative humidity, 67.4
28.....	29.917	37.2	49.0	26.0	0	Prevailing direction of wind (7 a.
29.....	29.872	26.6	42.7	20.5	*.04	m., 8 and 11 p. m.,) N. W.
30.....	29.624	24.1	36.7	18.8	*.11	Total movmt. of wind, 7,210 miles.

* Melted snow. † Frost. ° Fog.

NOTES: Barometer reduced to sea level and standard gravity. The dash (—) indicates precipitation inappreciable.

COMPARATIVE PRECIPITATIONS.

Inches.	Inches.
1871.....4.22	1879.....4.5
1872.....0.87	1880.....0.70
1873.....0.19	1881.....1.29
1874.....1.05	1882.....2.05
1875.....0.13	1883.....0.64
1876.....1.17	1884.....0.32
1877.....1.36	1885.....0.73
1878.....0.29	1886.....1.64

Number of clear days, 11.
No. of fair days, 12.
No. of cloudy days, 7.
Dates of frosts: Killing, 6th, 7th,
12th, 18th, 20th, 21st, 23d, 24th.

ALEXANDER POLLOCK,
Sergeant Signal Corps, U. S. Army.

DECEMBER, 1886.

DATE	MEAN BAROM- ETER	TEMPERATURE			Precipita- tion in inches and hundredths	SUMMARY
		Mean	Maxim.	Minim.		
1.....	30.540	2.3	24.5	-2.2	.00	Mean barometer, 30.242.
2.....	30.648	-0.1	7.9	-3.5	†	Highest bar., 30.877; date 4th.
3.....	30.633	2.0	9.7	-7.3	†	Lowest bar., 29.738; date 14th.
4.....	30.814	-3.1	10.8	-10.4	*	Monthly range of bar., 1.139.
5.....	30.379	16.0	30.5	-3.0	†	Mean temp., 17.9.
6.....	30.172	28.0	42.2	13.7	†	Highest temp., 55.0; date 9th, 10th.
7.....	30.214	27.9	43.9	23.7	†	Lowest temp., -15.2; date 27th.
8.....	30.108	33.6	50.0	12.9	†.01	Monthly range of temp., 70.2.
9.....	29.960	44.1	55.0	34.2	.00	Greatest daily range of tem., 37.1;
10.....	29.930	47.0	55.0	40.4	.00	date 8th.
11.....	29.913	41.2	47.5	35.3	°.42	Least daily range of temp., 11.4;
12.....	30.004	30.3	45.5	28.1	.00	date 2d and 18th.
13.....	30.053	34.4	45.0	23.3	†	Mean daily range of temp., 21.1.
14.....	30.041	27.3	46.0	10.8	†	
15.....	30.354	9.1	77.3	1.6	†	
16.....	20.334	23.7	31.0	8.9	.00	COMPARATIVE MEAN TEMPERATURE.
17.....	29.865	26.1	45.0	21.4	*	1871.....18.3 1879.....17.3
18.....	30.189	19.4	27.5	16.1	*.04	1872.....13.2 1880.....18.4
19.....	30.314	18.6	28.5	6.5	.00	1873.....24.8 1881.....36.0
20.....	29.922	32.2	45.0	21.5	*.01	1874.....28.2 1882.....24.6
21.....	30.306	18.7	31.0	12.9	*	1875.....33.9 1883.....28.6
22.....	30.222	24.6	35.5	10.9	†	1876.....19.0 1884.....17.3
23.....	30.189	19.5	36.0	11.5	†	1877.....39.8 1885.....28.6
24.....	30.291	7.4	18.4	-3.0	*	1878.....21.5 1886.....17.9
25.....	30.092	10.2	13.0	2.0	*.18	
26.....	30.393	-7.0	4.0	-12.0	*.78	Mean daily dew point, 11.9.
27.....	30.496	-1.6	8.7	-15.2	.00	Mean daily relative humidity, 77.5
28.....	30.499	4.3	14.3	-3.5	†	Prevailing direction of wind (7 a.
29.....	30.309	5.2	15.0	-2.0	.00	m., 8 and 11 p. m.) north and
30.....	30.183	11.8	19.5	-0.5	.00	south.
31.....	30.500	3.0	13.0	-7.0	*.02	Total movmt. of wind, 5,732 miles.

* Melted snow. † Frost. ‡ Fog.

NOTES: Barometer reduced to sea level and standard gravity. The dash (-) indicates precipitation inappreciable.

COMPARATIVE PRECIPITATIONS.

Inches.	Inches.
1871..... .91	1879.....1.75
1872..... .11	1880..... .28
1873..... .93	1881.....1.56
1874..... .54	1882..... .62
1875.....1.00	1883..... .73
1876..... .16	1884..... .72
1877.....2.14	1885.....1.17
1878..... .27	1886.....1.46

Number of clear days, 16.

No. of fair days, 13.

No. of cloudy days, 7.

Dates of frosts: Killing, 2d, 3d, 5th, 6th, 7th, 13th, 14th, 15th, 22d, 23d, 28th.

GEO. HASS HAGEN,
Sergeant Signal Corps, U. S. Army.

NEMAHIA COUNTY.

WEATHER SUMMARY FOR YEAR 1886.

BROWNVILLE, NEB.

MONTHS	Mean Temp.	WEATHER	NO. DAYS	REMARKS
January	10.8°	Clear	140	Although this vicinity suffered with drouth, the rainfall was $\frac{3}{8}$ inches more than last year—June, July, and August below the average. The year has been remarkable for drouth, excessive snow storms, and high winds, snow fall for January being 29.6 inches, and the greatest rainfall, May, 6.8 inches; coldest day, January 8th, mean temperature, 16.3° below zero; highest temperature, Aug. 15th, 102°. The whole range of temperature has been 124°, with a yearly mean of 51°—last year 49°—showing the lowest mean to be 48.5°, and the highest 52.8, for a period of 8 years. The drouth in July was followed by extreme heat in August. September opened hot and dry, followed by local rains about the middle of the month. October brought cooler weather, and early in November winter set in with fierce storms of wind and snow. The summer nights were made beautiful by the planets Jupiter, Mars, Uranus, and Venus grouping in the western heavens. This has been a year of extremes: while the martins arrived April 13th, the wild geese were flying southward as late as 29th December.
February	28.3°	Cloudy	150	
March	36.5°	Fair	70	
April	52.9°	Foggy, A.M.	15	
May	66.7°	Northerly winds...	191	
June	70.9°	Southerly winds...	174	
July	77.7°	Snow on ground...	104	
August	78.0°	Snowy	40	
September	68.6°	Rainy	51	
October	60.5°			
November	38.9°	Snow fall, inches...	52.9	
December	22.0°	Rainfall, inches....	34.9	
		Highest temp.	102°	
		Lowest temp.	22°	
		Least rainfall, Feb.	.25 in.	
		Least snow fall, April.....	2.5 in.	

All fractions are tenths except rainfall.

Respectfully,
GEORGE D. CARRINGTON.

ANOTHER YEAR'S STUDY OF OUR FORAGE PLANTS.

BY CHARLES E. BESSEY, PH.D., DEAN OF THE INDUSTRIAL COLLEGE OF THE UNIVERSITY OF NEBRASKA.

During the year which has just gone by since my last address before this society upon the subject of the grasses, I have devoted a good deal of time to the study of the problem of the best forage plants for this portion of the great plains. When we remember that this state is mostly given to stock growing, and that there is more money invested in this business than in any other department of agriculture, it becomes evident that a discussion of forage plants is eminently a proper one before such a body as this. What shall our sheep, horses, and cattle feed upon, is the great question the proper answer to which involves millions of dollars. If, as the wild grasses disappear, as disappear they will, we are not able to replace them with those which will be reasonably permanent, the growing of stock will cease to be the great and profitable industry it now is. To avert such a calamity may well take the time and some of the energy and power of this society.

In my address a year ago I confined my remarks to the grasses alone, and urged the use of Blue Grass for pasture and Timothy for hay, directing attention also to Orchard Grass, Red Top, and a few wild grasses. In this paper I shall enlarge the scope of the subject so as to allow the discussion of the clovers, and of some other plants which are of more or less value as forage, believing that even in the food of our domestic animals we should study to secure a considerable variety, just as we do in our own food. Upon this point I should like to pause a moment and urge that greater attention be given to it. The need is particularly great in the winter, when too often the poor ox is compelled to feed upon the dried leaves and stems of but one

kind of plant. We know from experience in our own cases that a continuous diet of but one thing, even if it be of the very best food, will after a while become positively distasteful; how much more so is it when the food is of rather indifferent quality? Those of us who have had the misfortune of eating month after month at the tables of a boarding house ought to have a sort of fellow feeling for these dumb brutes of ours. I have no doubt that they often feel just as we used to, when, after a dreary sameness of meat and potatoes, meat and potatoes, meat and potatoes, for week after week and month after month, our stomachs have risen up in rebellion, and we have turned disgustedly away from our untasted breakfast. "Variety is the spice of life," says the old proverb, and our experience justifies it in our own lives. Let us remember that it may be justified also by an observation of our domestic animals.

In dividing my paper into several heads, I shall notice (1) grasses proper, (2) clovers, and (3) other forage plants.

I.—GRASSES.

I shall confine myself to some notes upon the grasses I discussed more fully a year ago, adding such facts as have appeared since then, or modifying the statements then made as the experience of the year demands.

Timothy (*Phleum pratense*).—All the testimony and experience of the year show that the high place given to Timothy as a grass to be depended upon for hay is deserved by it. Its range throughout the state appears to be gradually increasing, as farmers are learning more and more of it by experience. There cannot now be any reasonable doubt as to the possibility of growing excellent fields of Timothy in almost any part of the state which is fit for any kind of cultivation.

To its excellent qualities, viz., ease of propagation, ease of cutting, ease of curing and handling, palatability and nutritiousness, which render it so deservedly popular, must now be added another for special situations. At the recent meeting of the Nebraska Dairy-men's Association, the Hon. William G. Whitmore, of Douglas county, called attention to the fact that upon the alluvial soil of the Platte valley he had found Timothy to be one of the best of pasture grasses.

This was corroborated by the well known stock grower of Fort Dodge, Iowa, the Hon. L. S. Coffin, who testified that upon certain soils Timothy has been found by him to endure pasturage most excellently. This is so at variance with the usual experience hitherto, that I deem it important that a record of it be made in this place. I saw Mr. Whitmore's field myself a few weeks ago, and it had then every appearance of being able to endure six or eight more years of cropping and tramping of cattle, as it has already done. It must be clearly understood that this field lies on the flat land bordering the Platte, and it is doubtful whether such experience could be duplicated on the higher land of the plains, but even if its valuable qualities for pasture should be confined to our river bottoms, that for the whole state will in the aggregate amount to a great many thousand acres. May I not ask of you, the members of this state society, that you make notes and experiments upon this point, and I shall esteem it as a great favor if you will communicate your results to me for collation and comparison.

Blue Grass (*Poa pratensis*).—I need say but little as to the esteem in which this grass is deservedly held for pasturage. It is every year being more widely sown, the acreage to-day being without doubt many thousands of acres greater than it was a year ago. Several points of a great deal of importance have been brought out by observation, correspondence, and discussion. They are as follows:

1. Much of the seed offered in the market is imperfect, and will not germinate. Whenever Blue Grass seed has any mustiness of smell it indicates that it has been cured under unfavorable conditions, and that in all probability it has been heated up to such a degree as to destroy its power of germination.

2. In sowing Blue Grass seed the plan of compacting the soil by heavy rolling or by the treading and tramping of cattle (as recommended by Dr. Gordon, of Tennessee) is found to produce most satisfactory results in the loose soil of Nebraska. Our light soil dries out so easily for the first inch or so that the minute seed of Blue Grass, which of necessity must be near the surface, are themselves dried up. Even when they make a start, a few days of dry weather will often wither up the slender little plants before they have had

time to send down their roots into the moister soil beneath. Every effort should therefore be made to make the soil as compact as possible after the seeds are sown, and the method practiced by Dr. Gordon may well be imitated. He turned in all his horses, cattle, and sheep, and allowed them to thoroughly tramp down the soil. In this way the soil is made compact enough so that it will retain moisture much nearer to the surface, allowing the seeds to germinate, and preventing the drying up of the young plant during the period of its infancy.

3. Another point of great importance is the fact that most excellent pastures are now made by sowing Blue Grass seed upon the unbroken prairie. After close feeding the wild grasses are sufficiently reduced in strength, so that the young Blue Grass plants are enabled to fight their way, and to eventually almost, if not entirely, eradicate the original grasses. Some of the finest and most durable pastures in the state have been made in this way.

Orchard Grass (*Dactylis glomerata*).—As to this grass I have but little to add to what has previously been said. Its growth appears to be slowly increasing in the eastern part of the state, and not a few farmers have assured me of their confidence in it as a valuable grass for early hay.

Red Top (*Agrostis vulgaris*).—For the lower lands lying along the larger streams Red Top is deservedly coming into favor and is recommended by many farmers. There can be but little doubt that this grass will eventually occupy about the same place here that it does in the more eastern states, where it is considered as exceptionally fine for hay for horses.

Wild Grasses.—Last year, as doubtless some of you remember, I called your attention to a wild grass which I named Muhlenburg's grass (*Muhlenbergia glomerata*). It is the grass which possesses the enviable distinction of showing the highest per cent of nutritive constituents of any of those which have as yet been examined by the government chemist. Now, a grass which is highly nutritious ought to be highly interesting to the stock grower, for it is nutritiousness that he is chiefly concerned in.

During the year I have been on the lookout for evidence as to its fitness for this soil, and I find everywhere abundant evidence that it

it is well suited to at least the soil of this portion of Nebraska. While I am sanguine that it will ultimately prove to be a valuable grass for the farm, it must still stand the test of practical and direct experiment, and this is to be undertaken the coming year upon the experimental farm of the Industrial college of the University. When results are obtained from them they will be duly communicated to the society.

II.—CLOVERS.

There are two important clovers, viz., the White Clover and the Red Clover, which should be grown upon every farm in the state.

White Clover (*Trifolium repens*).—This well known pasture plant is a native of both Europe and America. It was first cultivated nearly two hundred years ago in England, since which time it has held a place in English agriculture. In many parts of this country it has been greatly neglected and in many regions it is never purposely sown. It is, however, one of those blessings fortunately given to us by a kind Providence which continues to come to us even though we do not appreciate it as we should.

It is not to be considered as one of our hay producing plants, owing to its small size and creeping habit. Without doubt the failure to remember that White Clover is not held by anyone to be a hay plant has had much to do with its unpopularity. There can be no doubt that if a man should sow White Clover in the hope of securing thereby a field of hay, he would be justified in considering it a great failure.

But if a poor hay plant, it is on the other hand an excellent pasture plant, the very characteristics which unfit it for hay being those which make it the better for pasturage. It is highly nutritious and is relished by cattle and sheep, being freely eaten by them. It is very tenacious of life and can be eaten down and severely trodden by cattle and sheep, and it is only under the severest treatment that it will yield its life. Few plants of the farm will hold more tenaciously to the soil when once it obtains a foothold.

It will thrive upon almost any kind of soil, and appears to be especially suited to our Nebraska soils, nearly all of which contain more or less of alkaline constituents, of which all the clovers are especially fond. In the eastern states it is well known that a top dressing of

lime or ashes is always given to the soil when good crops of clover are desired. Here in the west Nature has saved us the labor of casting these alkalis upon the soil. They are there already, and are awaiting our demand that they shall nourish our clovers and other leguminous crops.

Allow me, right here, while upon the topic, to direct your attention to the fact that Nature has given us a hint as to which general kind of vegetation will grow best on this soil, in the natural vegetation which covered the plains. The botanist who rambles over these prairies is struck by the fact that the plants of the great pulse family (*leguminosæ*) are very abundant. Plants of the botanical genera *Psoralea*, *Astragalus*, *Desmodium*, *Ispedeza*, etc., occur in great abundance all over the state, increasing in numbers as we pass westward up the great slope to the foot of the Rocky mountains. Now these wild plants are near relatives of the clovers, and require very nearly the same kinds of soil as do they. Let us take the hint thus given us by Nature and replace these wild plants by their relatives, the clovers, just as we drive out the antelope and the buffalo and put in place of them *their* relatives, the ox and sheep.

Red Clover.—(*Trifolium pratense*).—This plant is a native of Europe, and appears to have been brought into cultivation in England a half a century or so earlier than its fellow, White Clover. It occupies a place at the present day in scientific agriculture that cannot be filled by any other plant with which we are acquainted.

As commonly grown it is a biennial plant, that is, it lives for but two years, although, as is well known, the plants may be made to live longer. In ordinary farming, however, it is better to bear in mind its biennial character as thereby loss and vexation may be avoided. In many cases the seeds which mature each year manage to keep up a succession of plants for a number of years, and thus give a perennial character to the field. This, however, cannot be relied upon, and unless grasses have been sown with the clover the field will be likely to be disappointing the third year.

As a hay producing plant Red Clover ranks high, possessing a nutritious value exceeding that of the best hay from ordinary grasses about as *two to one*: that is, taking the table of chemical analysis

computed by Dr. Way, we find that a ton of clover hay contains about twice as much nutritious matter as a ton of ordinary grass hay ; or let us put it in this way, that so far as chemical analyses go, a ton of clover hay ought to go as far in feeding as two tons of hay from the common grasses.

What I have said about White Clover may be repeated here as to the soils best suited to Red Clover. The same alkaline character which suits our soil to the White Clover, to even a still greater degree fits it for the growth of fine crops of Red Clover. I have seen as heavy growth of Red Clover upon the soil of Nebraska as I have seen in any part of the United States, and the testimony that I have collected indicates that there is scarcely a place in the whole state where it will not do well.

There are several varieties of Red Clover, some being regarded as much larger and more productive than others, but so far as my observation goes there is but little actual difference in their value for hay when well grown. Let no man in any part of this state refrain from the sowing of Red Clover because he cannot get the particular variety he wants. Let him get his pet variety if he can, but if he cannot do that let him sow any kind, always remembering that he will get good results from any Red Clover, if the soil be in good condition, and the seed be not too sparingly sown. Let the nutritious Red Clover be made to grow and blossom into beauty all over this beautiful state of ours to reappear a little later as the fragrant clover hay, and still later to be transmuted into the bone and muscle of our domestic animals.

III.—OTHER FORAGE PLANTS.

That we should grow more than grasses and clover for forage is now pretty generally admitted by most careful observers, but the question as to what other plants should be depended upon for this extra forage is as yet undecided.

I cannot attempt more in this paper than to call attention to a few of the plants, not grasses or clovers, which have been used in various times and places for forage. While I cannot in many cases give even a suggestion as to whether the plants will succeed or not, I trust that

what I say will not be wholly valueless. I may hope to induce some of you in different parts of the state to experiment in a small way upon some them, thus aiding in the solution of the question as to their practical value.

1. Lucerne (*Medicago sativa*).—This old plant has been long cultivated under many names, one of the latest of which is alfalfa. In California it is esteemed as one of the best forage plants. It has been sown repeatedly in many parts of the country east of the Rocky mountains, but for some reason it has not come into general use, even in those portions where the winters are not too severe for it. In nutritive qualities it is much like the clovers, to which indeed it is closely related.

2. Bokhara Clover (*Melilotus alba*).—This is another old plant with many good qualities, which we can scarcely afford to do without, if the plant can be profitably grown in this part of the country. It is capable of producing heavy crops and possibly might be profitably used in the making of ensilage. Like the preceding, this plant is a relative of the true clovers.

3. Beans and Peas.—In many parts of the world these are grown for food for domestic animals, instead of, as in this country, exclusively for human food. In Scotland the stems and leaves of the beans are esteemed as an excellent food for horses and other live stock.

4. Mustard (*Brassica alba*).—In England it is the custom in some places to grow a crop of White Mustard for the forage late in the season. It might be well to remember this, for by this means one might be able to eke out a scanty hay crop.

5.—Prickly Comfrey (*Symphytum aspernum*) has from time to time been recommended as a plant capable of producing enormous crops of forage. It has been used somewhat in England and has some advocates in this country.

6. Burnet (*Poterium sanguisorba*), a relative of the roses and blackberries, but destitute of woody stems, and Chicory (*Cichorium intybus*), related to the dandelion, are regarded by eminent authorities in England as deserving of more attention from stock growers than they have hitherto received, being capable of producing large crops of palatable forage.

7. Cabbage (*Brassica oleracea*).—So far as I am aware the cabbage is not grown in this country for forage. In England it has received some attention for this purpose and the results reported are very favorable to it as a profitable forage crop. It is said that a good crop will yield from thirty to forty tons of food per acre and is held in great repute as a particularly good food for fine sheep.

6. Root Crops.—Under this head may be included turnips, mangels, beets, carrots, parsnips, and artichokes, all of which are deserving of attention. I have no hesitation in saying that the future will find us relying more and more upon root crops for the supply of moist food which all of our domestic animals so much need in the winter months.

Gentlemen of the Agricultural Society of Nebraska, I am painfully aware of the fact that in the foregoing papers there are great defects, owing to the lack of reliable data upon many points. This subject is one of the greatest importance. In this state the old adage that "he who makes two blades of grass grow where but one grew before is a benefactor to his race" holds doubly true, for here our agriculture is not agriculture proper, but the growing of stock, and upon the success of our forage growing depends our success in stock growing.

Permit me again in closing to ask you to help me by sending samples of the various grasses and other forage plants, with statements as to their value gathered from your personal experience, to the end that our knowledge of these important plants may be increased, and the prosperity of our state in its great stock interests of many millions of dollars may be enhanced.

SWINE PLAGUE.

A PAPER READ BY DR. JULIUS GERTH, STATE VETERINARIAN, BEFORE THE STATE BOARD OF AGRICULTURE, JANUARY, 1886.

Mr. President and Gentlemen:

The state of Nebraska, representing a live stock interest of over seventy million dollars, a very large percentage of which is invested in swine, must in the near future give more than ordinary attention to the subject of swine plague.

Owing to its alarming spread in this state, your president, Mr. Dinsmore, requested me to prepare and read a paper on this disease before this association. I was somewhat reluctant in complying, fearing that the pressure of official business and the limited time would prevent me from writing a paper that would do the subject justice.

This fatal disease of swine, at repeated intervals, has infected the herds of the old world, and during the past twenty or thirty years has spread to an alarming extent throughout the United States and Canada, causing financial ruin to thousands of farmers.

To-day the disease can be found in every county in this state, and Nebraska within the past two years has suffered a loss of nearly five million dollars, the greater part of which could have been prevented by the adoption of proper sanitary measures. During the period of five months the Union Pacific railroad sustained a loss of over twenty-five thousand dollars, on one of their branch lines, in decreased shipment of hogs, owing to the existence of this plague in our midst, and the B. & M. railroad a corresponding if not greater amount.

Swine plague, therefore, at the present time, is one of the most important subjects that can be profitably discussed and considered by the State Board of Agriculture. It is not only the swine breeder, cat-

the feeder, farmer, and the railroads that are suffering, but every industry as well, causing an indirect loss so great that it cannot be estimated. The state of Nebraska can no longer afford to remain idle and wait for some one to discover a sure cure for this incurable malady, but must prepare and adopt such sanitary measures as will tend to check and eventually eradicate the disease. With this view I have prepared the subject, and hope that I may be able to show clearly how it can and should be done.

The existence of swine plague in Nebraska can be traced back prior to the year 1871, with the strong probability of having been introduced into the north-eastern counties of this state by sick hogs coming from Iowa. From that section of the state it spread south from one county to another, confining itself to the counties bordering on the western banks of the Missouri river, until it crossed the Platte and then spread in a western direction. After that period the disease abated to some extent, but never disappeared entirely from the state. For the past few years it has again been spreading to such an extent as to cause a loss of from 90 to 100 per cent of the animals attacked, with the aforesaid result.

Swine plague, commonly called hog cholera in the United States and swine fever in England, is also known by the name of enteric fever of pig, typhoid fever, pneumo-enteritis contagiosa, blue disease, red soldier, anthrax of pig, measles, pig distemper *schweinesenche*, etc.

Swine plague is probably the most simple and useful, as well as practical term. It may be defined as an infectio-contagious disease peculiar to swine.

Many years ago it was believed to be a spontaneous and enzootic affection due to local causes, such as bad hygiene and improper feeding.

In the United States its contagious nature was recognized at an early date, and the credit is due to American veterinarians of having discovered its true nature.

Swine plague is said to be no respecter of persons among the pig tribe. It attacks the old, the young, the lean, the fat, the scrub, the thoroughbred, the male and female alike. My experience has been

that well bred animals and shoats are more susceptible to the disease and that the death rate is greater. This has been attributed to a weak constitution. Full grown animals frequently escape, or if attacked recover, while pigs *in utero* often die and are aborted, or, if they survive the period of gestation, they will die as sucklings or remain feeble and puny during life.

I said the disease was infectious and contagious, by this I mean that it can be spread through the medium of the air, by fæces, urine, manure, water, food; by animals, such as rats, cats, dogs, rabbits, and poultry; by the boots or shoes and clothing of attendants; by cohabitation of healthy with diseased animals; by inoculation, and last, but not least, by contaminating freight cars and stock yards.

At times, owing perhaps to some unaccountable climatic influences, the disease is not so fatal as at present. Cold weather retards but does not check its spread. It was noticed that during the prevalence of north-east winds the disease would spread more rapidly than usual and the death rate increase.

The period of incubation is from four to five, generally from ten to twelve days, and in rare instances from six to seven weeks.

Its duration varies from several hours to a few days or weeks, and occasionally, when it assumes a chronic or sub-acute form, to several months.

The period of convalescence is equally indefinite, lasting from a few weeks to seven or eight months.

During my investigations of this disease, made under the direction of the United States bureau of animal industry, I availed myself of several opportunities to make post mortem examinations on so-called recovered cases of swine plague. Five post mortems were made on animals that had the disease from six to eight months prior to their being destroyed for examination. The animals were apparently healthy, in fact, they appeared so to such an extent that expert stockmen as well as myself failed to pick them out when requested to do so. In every case the lesions of swine plague were present. I consider this fact of great importance and believe that such animals, if introduced into healthy herds, will communicate the disease and will account for a number of so-called sporadic outbreaks.

The symptoms are loss of appetite, cold shivering, lasting from a few minutes to several hours, sneezing, more or less coughing, rise in the temperature of the body from two to four degrees, increased pulse, staring condition of the bristles, drooping ears, stupidity, loss of vivacity, sometimes vomiting, a desire to isolate themselves, and lie down in quiet, warm, and dark places, injected condition of the eyes, accumulation of mucus in the canthi of the eyes, partial blindness, more or less copious, at times bloody nasal discharges, dizziness, increased thirst, labored as well as hurried respiration, constipation, frequently followed by diarrhœa. If diarrhœa is present the fœces are semi-fluid, pastry, and of a dark grayish green color, oftentimes streaked with blood, the urine is scanty and frequently highly colored, the exhalations and excrements have a characteristic and peculiar odor, which at times is so penetrating as to announce the presence of the disease. The animal rapidly emaciates and frequently betrays a depraved appetite for dung, urine, dirt, and saline substances. They are frequently found lying down and when compelled to rise and move about they do so unwillingly, moving with a weak, staggering, slow, and stiff gait. There is a swelling of the head, eruptions in the ears and other parts of the body; the skin in many instances is hard and dry, the voice becomes faint, peculiar and hoarse, the animal manifests great indifference to its surroundings and an extremely offensive diarrhœa associated with general debility marks the approach of a slow and fatal determination of the disease; death ensues under convulsions, in some cases a cold, clammy perspiration breaks out all over the body. In those few animals which recover, the cough becomes more frequent but less painful, the fetid smell of the fœces disappears, the animals become more lively and slowly gain flesh and strength, notwithstanding that a hacking cough continues for a long time.

The post mortem lesions are seated in different parts of the body.

The blood is frequently very dark in color and thick; it may also have a tarry appearance, and always coagulates on exposure to the air.

In the thoracic, abdominal, and pericardial cavities, effusions of serum varying in quantity are common. On the serous membranes deposits of lymph are frequently seen.

The lymphatic glands, especially the mesenteric, hepatic, and bron-

chial groups, always present characteristic lesions. They are universally enlarged, dark in color, infiltrated with blood, and friable.

The lungs are more or less extensively infiltrated, at times to such an extent that portions thereof if thrown into water will sink. This degree of consolidation is dependent upon the duration of the disease. In animals where the disease had progressed slowly the red brown or gray hepatizations are common. Adhesions of the lung to the walls of the chest and cheesy tubercles are frequently found. The trachea and bronchial tubes are filled with a frothy mucus.

The heart is generally softened, flabby, dilated, and at times congested. In chronic cases the pericardium (the membranous sac enclosing the heart) is frequently found firmly and completely adherent to the heart, small portions of which can be detached by careful manipulation. Ecchymosed spots described as being common on the endocardium (the living membrane of the heart) I have never seen.

The intestines are usually inflamed, especially a portion of the small ones (the jejunum) and numerous peculiar growths or ulcerous tumors, varying in size and shape, are prominent in a portion of the larger ones (the cæcum and colon). The size of these growths varies from a pin's head to a quarter of a dollar, and the color varies from a yellow to a grayish brown and blackish. They are usually imbedded upon the mucous membrane, but at times perforate the walls of the intestines. The mesentery and omentum are generally congested.

The liver has a mottled appearance, is often congested as well as soft and pulpy. The gall bladder is filled with a semi-solid, granular, dirty, brownish substance. The spleen is dark colored and soft, frequently pulpy.

The kidneys exhibit no very marked change to the naked eye, but still its capsule can be easily removed.

Treatment for swine plague cannot be recommended. It should never be attempted, as it does not pay.

INOCULATION.

In order to appreciate and thoroughly understand inoculation, it is necessary to mention that swine plague is produced and

spread by a germ called the *Bacillus suis*, a minute organism microscopic in size and described by Pasteur to resemble a short rod with rounded ends. It is found in all the fluids and tissues of an animal afflicted with this plague and never in healthy animals. This germ has been successfully attenuated; that is weakened and prepared by Pasteur (the celebrated French scientist), so that it now can be introduced into healthy animals without danger, producing in them a mild form of the disease, after which it is claimed that they acquire immunity, or if they take the disease it will develop in a mild form only.

Inoculation for this disease has been successfully performed by Prof. Law and by Klein with a modified virus, but whether the inoculated animals afterward were proof against the invasions of the disease I never learned.

Early in October, 1885, I was furnished with Pasteur's swine plague virus, procured from his laboratory in Paris.

On November 2 I inoculated twenty-six pigs, varying in age from five to six months, at the college farm, with what is called the first vaccine, and with the second vaccine ten days later.

On November 4, 18, 24, and December 1 each, one of the inoculated animals was killed, and post mortem and microscopic examinations made. The microscopic examinations were made by Prof. Charles Bessey with the aid of the University microscope, the only one in this section of the country with which reliable scientific work can be done. In all the post mortem examinations there were lesions of swine plague, well but not extensively marked. In the virus as well as in the blood and serum of the inoculated animals, and the blood and serum of animals dying with the plague, Prof. Bessey found the same identical germ, showing conclusively that the pigs had become truly inoculated, and that the swine disease of France is the same disease as ours. The inoculated animals are now exposed to the ravages of the disease, as five diseased animals furnished by J. J. Imhoff were placed among them on the 12th instant. Two uninoculated animals also have been allowed to intermingle with the diseased and inoculated ones. This number is hardly sufficient for a fair test, and I hope that not less than twenty healthy animals will be placed

with the others. Two of Mr. Imhoff's animals have succumbed to the disease.*

The German government made experiments with Pasteur's virus last year, and the results were reported satisfactory.

His method of preparing the swine plague virus is known to but few of the profession at present.

Having learned that my friend Billings was with Pasteur studying his method of preparing hydrophobia virus, I cablegrammed him to endeavor to secure Pasteur's method of preparing swine plague virus. A few days ago I received a reply from him stating that he had met with success.

PREVENTION.

How can we get rid of swine plague in this state? Gentlemen, I will answer this question in a brief manner, and state that until the benefits to be derived from inoculation have been thoroughly tested, it is absolutely necessary that every animal diseased with swine plague be killed, and all others that have been exposed thereto be slaughtered under the supervision of an inspector; the enforcement of quarantine regulations, and compulsory disinfection of all infected places. I may here mention that the above statement is in accord with the opinions of the best veterinarians of France, Germany, Great Britain, and the United States.

In England, like here, within the past few years swine plague has decimated their herds, and the "British privy council," on November 15, 1885, was, so to speak, compelled to adopt the following order:

"COMPULSORY SLAUGHTER BY LOCAL AUTHORITY.

"1. Notwithstanding anything in the animal order of 1884, swine fever amendment, every local authority in England and Wales and Scotland shall, within two days after the disease is known to them, cause to be slaughtered: (a.) All swine within their district that any time during the month of December, 1885, are affected with swine fever; and, (b.) All swine within their district being or having been at any time during the month of December, 1885, in the same pig sty or shed, or in contact with any swine affected with swine fever.

*Since writing the above five (5) of the inoculated animals have died of the disease.

"COMPENSATION.

"2. The local authority shall, out of the local rate, pay compensation as follows for swine slaughtered under this order: (a.) Where the pig slaughtered was affected with the swine fever the compensation shall be one-half its value immediately before it became so affected, but so that the compensation do not in any such case exceed forty shillings. (b.) In every other case the compensation shall be the value of the pig immediately before it was slaughtered, but so that the compensation do not in any such case exceed four pounds."

Swine fever was reported to be rapidly diminished at the time the above order was adopted, the average of swine attacked having fallen from 1,755 in one week in June, to 559 in the week ending November 14. The *Live Stock Journal*, commenting upon this latest effort to thoroughly exterminate the disease, says:

"Local authorities should be urged to do their duty in a thoroughly efficient manner. They should be ruthlessly exacting at all points. What is to be feared most is that the cleansing and disinfection in some cases will be of a careless and perfunctory character. The virus of swine fever is most difficult to eradicate, and the majority of pig stys are almost impossible to cleanse and purify. Careful watch should also be made of all infected premises, that there be no smuggling of pigs into them before the termination of the legally defined time of the twenty-eight days, and then only on being perfectly assured that the work of sanitation has been satisfactorily completed. If pig owners and local authorities do their duty, we shall be nearly, if not entirely, rid of the pestilence by the end of the year."

In view of this subject I will conclude my remarks by once more calling your attention to the importance of inoculation and benefit to be derived therefrom, should it prove to be a success, and therefore hope to see the efforts of the live stock sanitary commission and myself, aided by this board, in continuing these experiments and our endeavor to secure the method of preparing swine virus, so that it can be made and supplied by our department for the benefit and use of every swine breeder and farmer in the state.

EIGHTH ANNUAL REPORT
OF THE
FISH COMMISSION OF NEBRASKA.
FOR THE YEAR 1886.

SANTEE FISHERY, December 31, 1886.

In presenting their Eighth Annual Report of the work of the Nebraska Fish Commission, the commissioners beg leave to commend the very intelligent and efficient labors of Superintendent Martin E. O'Brien, by whose large experience and faithful attention the work of the commission has been carried forward with the most gratifying results since the last meeting of the legislature.

It is indeed a matter of congratulation that so much has been accomplished with the small appropriation asked by the commission, and generously given by the legislature two years ago. The expenditure of the money appropriated for building and repairing ponds, stone dams, improvements to the dwelling house, hatching house, facilities for handling fish eggs, rearing and distributing fish, and complete success, all testify to his forecast, prudence, and integrity. No instance has come to the knowledge of the commission of the needless or careless expenditure or misappropriation of a single dollar of the state's money by him. Yet we are free to say that the salary now paid to him, nine hundred dollars a year, is inadequate to the requirements of the position he occupies, as well as the increased demands and responsibilities of the work demanded of him. It is not the work of an amateur or of common experience that any one may successfully perform. It requires a technical knowledge of the occult science of fish culture, coupled with practical experience, to attain success, both of

which Mr. O'Brien possesses in an eminent degree, and which in equal degree in any other practical science, in mechanics or therapeutics, would command several times the compensation now paid in this very important work. The commissioners believe that the foregoing considerations justly entitle him to a much larger salary, and recommend that it be raised to at least twelve hundred dollars per annum.

CARP CULTURE.

The growth of this branch of the work needs only to be epitomized to show its importance.

In 1884 the commissioners furnished this valuable fish to thirty-two persons who had constructed ponds suitable for taking care of them. The number of fish furnished for that purpose was 640, or 20 to each person. They were distributed nearly all over the settled portions of the state, or in about twenty counties.

In 1885 the number of persons receiving carp from the commissioners was 95, to whom were delivered 2,745 fish, embracing a much broader area of the state than those of the year before.

In 1886 the number of persons supplied was 250, to whom have been delivered or sent by express 8,720 fish.

These fish are usually distributed in the months of October and November, and at the time of distribution are four or five months old and will measure two or three inches long.

The commission has experienced great difficulty in obtaining reports from persons receiving fish. This no doubt is largely attributable to the fact that the fish have been put into the ponds and left to take care of themselves, and their owners not being provided with the means of ascertaining whether their fish have lived or died, are not able to make any intelligible report of them. But many persons have reported, and generally their reports contain facts that are very encouraging. No case has been reported of a failure, except in case of accident or misfortune. In a few instances the fish have died or been destroyed by some unknown cause, but the ratio of success as shown by letters accompanying this report, is truly wonderful, and establishes the fact that the carp is truly and eminently the farmer's fish.

We invite special attention to the accompanying letters from those who know the facts stated by them. Many verbal reports have come to the commissioners from creditable persons confirming those published.

The food quality of these fish is excellent.

Mr. Carston, of Douglas county, reports that the fish delivered to him in October, 1885, being at that time two or three inches long, in one years, time grew to be from sixteen to eighteen inches long, and weigh from two to two and a half pounds.

Mr. Avery, of Douglas county, also reports his carp, one and a half years old, measuring eighteen inches long, six inches broad, and weighing from three to three and a half pounds.

Mr. Rohwer, of Washington county, says that his carp of 1885 product now weigh from two and a half to three pounds.

Several persons in the state, encouraged by the success in a small way, have entered upon the business of raising this and other species of fish for market, and others are contemplating entering into the same enterprise.

The facilities in this state for private fish ponds are not excelled by those of any other state in the union, and the people are beginning to understand the comparative ease and economy with which they can accomplish the desirable result of raising their own fish, besides the pleasure derived in its accomplishment, without regard to the profit that may be derived as a business engagement. There is no doubt that within a few years the fish growers of Nebraska will be found in our markets with the product of their ponds alongside with those of the fields; when the carp, the bass, the pike, and the trout, all raised in Nebraska water, will tempt the gastronomic proclivities and refinement of the epicure, at a price within the easy reach of all conditions of people—"a consummation devoutly to be wished."

BROOK TROUT.

This species of fish, planted by the commission in the months of February and March, 1884-85 and 6, in the streams of the northern and western parts of the state have lived and made excellent growth.

The commission have not received detailed reports from all the localities where these fish have been planted, but from such reports as we have, both written and verbal, by reputable citizens, there is most incontestable proof that this branch of the work is completely successful. We refer with pleasure to the letter from Major Henry Lippencott, post surgeon U. S. A., at Fort Niobrara; also to the letter of Hon. George A. Brooks, of Bazile Mills, Knox county, also published with this report. The "strange fish" has been reported to members of the commission from other places.

Those planted in 1884, elsewhere, have doubtless spawned this fall like their beautiful congeners at Bazile Mills. The strange fish seen by the boys, companions of the one they captured by shooting it, were up in that little stream spawning, as it is their instinctive habit to return to their native stream to spawn when old enough to propagate their species. These adult fish would not have left the deep stream below for any other purpose, either at this or any other season of the year, and especially at this season. It is very doubtful if a better record of the growth of the trout at Bazile Mills has been excelled anywhere at the age of the specimen mentioned in Mr. Brook's letter, two years and nine months old, without special care and feeding. This is a natural growth, in its wild state, and shows that the streams of Nebraska contain the best of food for trout; and in a few years hundreds of the streams of the state will teem with the speckled beauties, all through the northern and western borders of the state, while the bass, the wall-eyed pike, and carp will people the waters of the eastern and central portions of the state.

BLACK BASS.

The work of the commission in this regard has been attended with gratifying results. In every instance, where these desirable fish have been planted, from which we have received reports, the fish are doing well, in private as well as in public ponds and lakes. The commission has increased the facilities for breeding these fish, and will no doubt be able in a short time to supply black bass for every unstocked lake and stream in the state.

WALL-EYED PIKE.

The report of the superintendent shows with what success this branch of the work has been carried forward notwithstanding the great difficulty in handling with safety, both the eggs and the fry. The commission need more adequate means for transporting the young fish to different parts of the state. Shipping them in cans such long distances (in many cases several hundred miles), often requiring two or three days en route, is attended with great inconvenience and hazard, and sometimes total loss of the fish; and we earnestly call attention to our last report on the subject. Much better results could be accomplished if the facilities there referred to can be procured.

The commission recommend that the work of supplying the wall-eyed pike to our lakes and streams should be continued until every lake and stream adapted to them shall be well stocked with this valuable fish. It is a good grower, and its natural food exists in abundance in all fresh water lakes and streams in the state.

The sum appropriated two years ago for obtaining "fish eggs, fish, keeping them, printing, postage, etc.," was entirely inadequate to meet the legitimate necessary expenses demanded in the work of obtaining fish eggs and fish, and distributing or planting the same; and for this reason the work performed in that essential branch of the business has been greatly curtailed in order to keep within the limit of the appropriation for these objects, and the results, for this reason, have not been what they otherwise would with a more ample provision for meeting this branch of the work, the most important of all. The facilities at the fishery are sufficient for much greater work. The waters of the state adapted to useful species of fish are more extensive than is generally understood, and are generally distributed over the entire territory, not excepting a single county, and scarcely a township in the whole area of 76,000 square miles.

The planting of trout, bass, pike, and other species of food fish in a few streams and lakes makes very little show. As an experiment to test the practicability of the enterprise, this condition is only justifiable. It has required years to demonstrate the fact, but since it is now proven beyond doubt or cavil, the board are fully justified in asking more ample provision in this behalf.

The supply of valuable food fishes in the lakes and streams of this great state for the ultimate use of its rapidly increasing thousands of inhabitants is within the reach of well directed energy in that behalf. It is no longer an experiment. It needs only the liberal hand of the legislature to assure it by needed appropriation to carry on the work, and judicious legislation for its protection from the destructive methods and the greedy avariciousness of the market fisherman, who ekes out a miserable existence by destroying that which he in no way aids in producing.

A law providing for the election or appointment of an officer in each precinct, clothed with the authority and official duty to make arrests of persons violating the laws for the protection of game and fish, and to seize the guilty devices used in their nefarious business, and confiscate them, with adequate punishment of the individual, should be speedily passed and rigorously enforced.

The commission again recommend that the law prohibiting the taking of fish in the inland waters of the state with seines, nets, and other devices, except by hook and line, should be amended so as to more clearly define the distinction between private and public ponds and streams. A pond or stream embraced within the boundaries of a single or common ownership may be, and probably should be, excepted from such prohibition. But, on the contrary, meandered lakes and streams, and all lakes and streams not under the exclusive dominion of a single owner, or joint ownership in common, are in the nature of public waters, and legislation upon the subject should be clear and specific. As the law now stands some persons claim that the owner or lessee of the land upon one side of a stream, as the Elkhorn river, for instance, may stretch a trammel-net or draw a seine for catching the fish that pass and repass in the stream, and by parity of reason, by leasing a small strip of a few rods, or feet, even, along its opposite bank, may stretch his nets from shore to shore and thus arrest the passage of every fish, both great and small. Of course this is not a true interpretation of the law, but its present phraseology affords a quibble for those whose greed and selfishness impel them to seek some excuse for violating the law, and makes prosecutions for such violations sometimes difficult. With the enforcement of reasonable and

adequate laws in this behalf, the work of the fish commission will result in the stocking of every stream and lake in the state with valuable food fishes, and add both wealth to the state and comfort and amusement to its people.

We desire to notice the continued and uniform assistance and courtesy of the railway companies in aiding the commission in carrying on its work, by furnishing free transportation to the commissioners, superintendent and messengers, with permits to carry fish cans in the baggage cars.

The commission earnestly recommend that an appropriation be made by the legislature for establishing in connection with the fisheries a museum where specimens of the fish fauna of the state may be collected and preserved as well as *batrachia* and other animals that subsist upon or are destructive to fish. The inauguration of such an enterprise would not cost a large sum at the utmost, and would be attended with valuable results in the propagation and care of fish, as well as the enlightenment of the people upon this very much neglected subject. A suitable building of brick or stone can be erected for \$2,500 to \$3,000, which, with an incidental fund of a few hundred dollars for furnishing needed apparatus, etc., would place the enterprise upon a practical footing with the other work of the commission. The superintendent has already commenced the collection and preservation of both fish and *batrachia*, incidental to his other work, but of necessity in a limited degree, because he has not the room at his command in which to keep them when procured. The exhibition of the few specimens of both live and preserved fish, etc., at the state fairs in 1885 and 1886 at a very slight expense to the commission has created a widespread interest in the state in the matter of fish culture and shows conclusively that the inevitable result of a collection as here spoken of would be of vast benefit to the people of the state.

For prosecuting the work of the commission for the years 1887 and 1888 the commission recommend that the following sums be appropriated, viz. :

Salary of the superintendent.....	Two years.....	\$2400 00
Necessary labor.....	“	1600 00
Apparatus and furniture.....	“	900 00
Obtaining fish eggs and fish.....	“	2000 00
Building and preparing ponds.....	“	1600 00
Keeping team, fish feed, bridge tolls	“	600 00
Transportation and planting fish, printing, stationery, postage, tel- egraph and telephone.....	“	2400 00
Expenses of the board.....	“	1000 00

Total\$12500 00

R. R. LIVINGSTON,
W. L. MAY,
B. E. B. KENNEDY,

Fish Commissioners.

NOTE.—Since writing this report a fine mirror carp, thirty-one inches long, and weighing eleven and a half pounds, was taken in the Missouri river, near Plattsmouth, December 23d, and exhibited to Commissioner Livingston. Very likely this fish escaped from the Santee fisheries during the incumbency of the former superintendent, since other carp have heretofore been taken in the Platte river, and goes to show that this valuable fish thrives well in the open waters of the state.

R. R. LIVINGSTON,
W. L. MAY,
B. E. B. KENNEDY,

Commissioners.

To the State Board of Fish Commissioners:

Included in the annual report of the commission for 1885 I gave a brief detailed report of the fish exhibit at the Nebraska state fair at Lincoln, and made, under instructions of the board, as one of the branches of the work undertaken to create and further the interest in

the subject of fish culture, and to show to some extent the character of the practical work accomplished by the commission in introducing and propagating the species best adapted to Nebraska waters.

The result of that exhibit and the evident interest awakened among those who embraced the opportunity of witnessing this practical result of the commission's work at the hatcheries—thus made more easily accessible—encouraged the idea of repeating the experiment the present year, and in pursuance of this, at the suggestion of the State Board of Agriculture, I brought before their session a plan for a more extensive exhibit, the foundation for which was prepared in the erection of a building specially adapted for the purpose, in a convenient location on the fair grounds, with thoroughly adequate facilities for carrying out the purposes designed.

This enterprise, so cheerfully forwarded by the members of the State Board of Agriculture, is worthy of special mention as being the first of the kind undertaken under the auspices of the State Board, and made a feature of its annual exhibit at a state fair.

That the enterprise has proved a success, I believe is the verdict of all who witnessed the exhibit, as shown by the interest manifested in the large numbers who examined the display and made inquiries of the various features of fish propagation.

The building provided for the occasion and intended for permanent use for the purpose is of slightly proportions, thirty by fifty feet in dimensions, with proper facilities for light and water, and a row of glass aquariums extending through the center of the building, and a large fountain and basin, also serving as a receptacle for the various species of fish embraced in the exhibit.

Among the specimens from the state hatcheries were brook trout, mountain trout, wall-eyed pike, German carp, of various ages and sizes of each species; also specimens of the fishes native of Nebraska waters, as pickerel, black bass, hickory shad, buffalo fish, catfish, bullheads, sunfish, quill backs, and other varieties, with a varied collection of specimens of water inhabitants not belonging to the class of food fishes.

Included in the display were jars and other apparatus from the hatcheries, showing the different stages and methods of the propa-

gating process, and illustrating to a limited extent the character of the work done under the supervision of the superintendent at the hatcheries. In this connection, I desire to testify to the faithful and zealous co-operation of Mr. M. E. O'Brien, the superintendent, and to the intelligent and practical methods of his work as illustrated in the success attained at the institution over which he has supervision.

Besides the live fishes on exhibition, were an interesting and attractive series of the leading inland and ocean fishes in water color portraits by Kilbourne, entitled the "Game Fishes of America;" a fine collection of plaster casts of fishes, kindly loaned by Mr. S. P. Bartlett, secretary of the Illinois Fish Commission; a varied assortment of alcoholic specimens in jars, consisting of white fish, grayling, and numerous varieties of trout, contributed by Mr. Frank N. Clark, superintendent of the branch United States Hatcheries, at Northville, Michigan; a fine collection of stuffed specimens of deep sea fishes, a second time generously loaned by Hon. E. G. Blackford, of the New York Fish Commission; a large variety of pictures contributed by Prof Spencer F. Baird, of the United States Fish Commission, and to whom we are indebted for many other appreciated favors in the securing of this display, as well as to Professors Goode, Bean, and Rathbun, his assistants; besides a collection of about fifty jars of marine invertebræ and deep sea fishes, forwarded from various sources of the government service; Mr. A. Booth, of Chicago, also contributed a number of interesting curios which added to the attraction of the exhibit. Besides these features of the display there was a large collection of photographs of scenes representing the fishery industries of the United States at various coast stations; and hanging on the wall was a fine crayon portrait of Hon. S. F. Baird, United States commissioner of fish and fisheries; also photographs of the officers of the American Fisheries Society, who have exhibited a commendable interest in the success of the enterprise inaugurated under such auspices in Nebraska.

For the measure of success which this project was able to attain, much credit is due to the members of the State Board of Agriculture, and especially to Messrs. S. M. Barker, president, and Robert W. Furnas, secretary, whose association with Nebraska's productive in-

terests has given him a nation-wide reputation; Edward McIntyre, chairman, and Messrs. Nicodemus, Dunham, Dinsmore, and Grennell, of the Board of Managers; Austin Humphrey, superintendent; O. M. Druse, master of transportation; Captain Hamilton, chief of police; and also Mr. J. D. Macfarland, president Lancaster County Agricultural Society, to whom so much is due in the inception and carrying out of the plans for the building. Besides the valuable assistance rendered by these gentlemen in contributing so materially to the success of the project, I desire to express obligations to Messrs. E. P. Ripley, general freight agent, and Paul Morton, assistant, of the C., B. & Q. R. R.; Mr. George W. Holdrege, general manager, and Mr. D. E. Thompson, assistant superintendent, of the B. & M. in Nebraska, over whose lines all exhibits to this department were carried free of charge; as well as to Mr. W. F. Bechel for like favors through the Pacific Express company. To the gentlemen of the press who so faithfully chronicled the features of the exhibit the public are also indebted, as well as those more immediately interested, for the interest they have helped to awaken in this important subject.

With the acquisition of the present large variety of specimens in the various features of fish propagation, and the appliances and means of showing them to best advantage now in possession of the commission, I would suggest that a permanent museum might beneficially and without much outlay be established at the state hatcheries, and I hope that such a feature may be provided for in the near future, believing it would do much in forwarding the interest in this subject, to which sufficient importance has not heretofore been attached.

In concluding I have reason to believe that the efforts of the commission, which have thus been so warmly seconded as evidenced in the result of what is now no longer an experiment in the exhibit of the fish industry of the state, have been the means of awakening a new interest in the propagation and protection of food fishes whose beneficial effects will continue to be experienced as long as intelligent and patriotic efforts are encouraged; and that with the progress now attained in the practical work of introducing and distributing in the waters of the state the fishes which experience has now shown to be best

adapted, there will soon be ample returns for the efforts put forth in this direction.

W. L. MAY.

FREMONT, Dec. 4th, 1886.

STATE FISH HATCHERIES, Dec. 31, 1886.

To the Honorable Board of Fish Commissioners:

GENTLEMEN—In response to your request, I herewith submit my report as superintendent of the state fish hatcheries, accompanied with a detailed statement of the work done at the fisheries, and the hatching and distributing of fish during the year ending December 31, 1886.

There have been distributed from the fisheries this year 5,050,000 wall-eyed pike; 108,000 brook trout; 55,000 salmon trout; 9,000 California mountain trout, and 8,720 German carp; and have on hand about 3,000 carp which will be distributed before the last of January. These are all of this season's product of the state hatcheries. All the fish kept in the ponds at the fisheries for breeders, both the young fish and those old enough to breed, have done remarkably well, and are all in excellent condition at this time.

The demand for all varieties of fish cultivated at the hatcheries is constantly on the increase, showing that the people from all parts of the state are getting thoroughly interested in the work of the fish commission; which is evidenced by the fact that over 250 ponds have been constructed and stocked with good fish during the past season. This does not include about 3,000,000 of young fish that have been planted in the open waters, such as lakes and rivers; and from all information obtainable the results of these plants are most successful. During the past season our facilities for hatching and distributing fish have been greatly increased, and we now have the capacity for handling 35,000,000 of young fish annually, besides increasing our facilities for hatching fish.

We have, during the past season, constructed two new fish ponds, so that we will be enabled to keep on hand a larger supply of fish for breeders. We have now altogether twelve ponds, with a surface area of about three acres, and containing a stock of about 55,000 fish of the different varieties, from one to three years old. The brook trout

at the hatcheries commenced spawning this season on the fifteenth of November, and I have so far taken and laid down in the hatching trays about 100,000 eggs, and have a sufficient number of breeders remaining in the spawning race to give 25,000 more. This will insure a supply of 125,000 eggs of the brook trout, and possibly more before they are through spawning. These fish will hatch in ten weeks, and will be distributed during the months of February and March.

We also expect to take several thousand eggs from our stock of mountain trout, which will be hatched and distributed during the month of April. The mountain trout will commence spawning about the first of February.

During the past year we have made many necessary improvements in the hatchery and about the grounds, and many more are yet needed to give the place a respectable appearance. The care of the fish in the ponds required considerable time and attention. Each of the ponds that contain fish has to be drawn off at least twice during each season, either for the purpose of removing the young fish to be distributed, or for the purpose of cleaning them of all leaves and rubbish, or anything they might contain that would be injurious to the fish. Whenever the ponds are drawn off the banks and dams are always carefully examined, and any weak places or breaks that may be found are immediately repaired. The greatest care and attention is at all times required in the care and handling of fish, as the slightest mistake or neglect might cause the loss in one hour of that which it would take years to replace. The demand for young fish this year was four times greater than that of last season, and we have at present over two hundred applications on file waiting to be supplied from our next annual distribution, and not a day passes that I do not receive from five to ten letters, either applications for fish, or inquiries regarding the mode of constructing ponds, or the manner in which fish may be obtained from the commission.

During three months in the past year, from the first of September to the first of December, I received and answered six hundred and seventy-seven letters regarding the cultivation and distribution of fish in Nebraska waters. The commission will need during the next two years three additional breeding ponds, two for carp and one for trout.

Some of the wooden dams in the old ponds will either need repairing or be replaced by stone dams. The hatching house, barn, and ice house need painting; and to keep a large stock of breeding fish on hand will increase our expenses considerably. The increase in the number of fry for distribution will also bring an increase in the expenses of the commission, and I hope that the next legislature be asked to increase the fish commission appropriation for the next two years, so that the work can be carried on in the manner which our facilities now permit.

BROOK TROUT.

This fish takes the first rank as a fish to be artificially propagated for the purpose of stocking ponds that are spring fed, or the larger streams and brooks that are fed by springs or cold running water; and ponds and streams not possessing these qualities are unsuitable for brook trout.

There have been distributed from the hatchery in the past three years about 350,000 brook trout fry. The greater portion of this number have been planted in streams that are mainly spring fed, and we have reliable information that a number of trout from eight to twelve inches long have been taken with rod and line from some of these streams during the past summer.

We have reports from persons who have stocked ponds with trout in the counties of Webster, Thayer, Cass, Lincoln, Holt, Cherry, and Douglas showing that the fish have not only lived, but have made a remarkable growth. During the month of February, 1885, the commission planted in a pond near the Omaha stock yards 5,000 brook trout of that spring's hatch. John F. Boyd, superintendent of the stock yards, reports to the commission that during the past summer he took out some of the trout that measured twelve inches and weighed two and a half pounds. I think that this is conclusive evidence that the brook trout can be cultivated in this state successfully and with profit.

We have in the ponds at the fisheries about 35,000 brook trout from one to three years old, all in excellent condition; and from this stock of fish we will soon be able to distribute more than a million trout annually.

CALIFORNIA MOUNTAIN TROUT.

This favorite fish is now being cultivated by nearly every state in the north-west with the greatest success. It is a very vigorous fish, will live well in captivity and grow rapidly. This species of trout may be taken with almost any kind of bait. It will rise readily and greedily to the fly or the grasshopper; raw meats, grubs, worms, and minnows all seem to be eagerly desired. Unlike the brook trout, it will live and thrive in moderate currents of water, and in the small fresh water lakes where the bottom is springy, and where the lake has a sandy or gravelly bottom for their spawning beds. Of about 20,000 eggs received from the California trout station at Baird, in the past two years, the commission have hatched and distributed to applicants about 10,000 young fish, besides about 7,000 that have been put in the ponds at the hatcheries for a stock of breeders.

In nearly every instance where we have had reports from those planted in ponds, the result has been a success. Those that we have kept at the fisheries have made an excellent growth, and I expect to take spawn from some of them during the months of February and March.

LAKE, OR SALMON TROUT.

During the fall of 1885 the commission obtained 75,000 eggs of the salmon trout, 50,000 donated by the U. S. commission and 25,000 bought of B. F. Shaw, Cedar Rapids, Ia. These were brought to the fisheries and hatched with a small per cent of loss. Of this lot 35,000 were planted in ponds and lakes in different parts of the state, and the commission received reports from some of the plants made, stating that the fish are living and have made a remarkable growth. This trout undoubtedly possesses characteristics and habits very different from either the brook or mountain trout.

They may be taken with the hook baited with raw meat or a piece of fish, but as they are ravenous feeders almost any kind of bait will serve the angler's purpose. Their great size and immense strength alone give them value as a fish of game, but when hooked they pull strongly and fight hard, though they seldom, if ever, leap out of the water like the brook or mountain trout.

Their natural habitat is Lakes Superior, Michigan, Huron, and probably all the great lakes which lie between the United States and the Arctic seas, and they were not found outside thereof until their comparatively very recent distribution by fish commissioners through the clear and cold waters of nearly all the northern states. The lake, or salmon trout is now becoming well known, and will doubtless hereafter occupy and thrive in most of the waters where it has been placed and adapted.

PIKE, PERCH OR WALL-EYED PIKE.

This fish is known in American waters as the Jack salmon, glass-eyed pike, western salmon, yellow pike, and pickerel. The color is yellowish-olive above the lateral line, lighter on the sides, silvery beneath. The head and gill covers are mottled with green. Its scales are hard, close, and difficult to detach. The mandibles are wider, and the jaws stronger than those of the grass pike, while its teeth are shorter and closer set.

It is exceedingly voracious, and is highly prized as food. It can be caught readily with the hook baited with minnows or crayfish. Its average weight is about four pounds, although there have been specimens taken weighing as high as sixteen pounds. During the past two years the commission has planted in the waters of this state over 10,000,000 of young pike. A large portion of this number were planted in lakes and rivers, and the opportunities for ascertaining their condition are at a minimum; however, we have reports from some of the plants that were made in some of the small lakes and ponds, showing that they have lived and are making a good growth. Several thousand of these fish were planted in the Santee lakes, and I know that a good many specimens have been taken the past season from this lake with rod and line. The experiment in stocking the waters of this state with pike having proved successful, the commission has decided to continue the propagation of this fish on a larger scale.

We now have facilities for hatching 25,000,000 of the pike, and if we can be successful in obtaining a full complement of eggs next spring, we will have during the months of May and June several millions of young pike with which to stock the waters of the state.

BLACK BASS.

Among the various candidates for popular favor for introduction into new waters, the black bass has always deservedly occupied a high place.

The excellence of its flesh, its rapid growth, its endurance, and its game qualities all contribute towards this appreciation. From time to time this fish has been introduced into the waters of the different states and territories, so that now there is no part of the United States east of the Rocky mountains where it may not be found in greater or less abundance.

The bass begin to spawn about the middle of May. Almost a month previous to their spawning they pair and leave the deep water where they have spent the winter, and seek out some spot in shallow water about eighteen inches deep. Here they make their nests by scouring from the sand on the bottom all the mud and moss. Here the female deposits her eggs which at once become glued to the pebbles, where they remain for ten or fifteen days, when they hatch. The female remains all the time on guard near the nest to keep off predatory intruders.

Little need be said of the merit of this fish for the table. There are but few fresh water fishes that are its superior at all seasons of the year, excepting during the spawning time. Its flesh is firm and flaky, sweet, tender, and juicy. During the year 1885 the commission obtained sixty adult bass from a lake near Fremont. These were brought to the fisheries in good condition, and put in one of the breeding ponds with eight other parent bass that had bred in the pond during the summer. The pond was well stocked with chubs and shiners for food for the main stock. It was confidently expected that these would breed this season and produce several thousand bass for distribution. During the month of September the pond was drawn down, and to our disappointment there was not a single young bass in it, and as there was no possible way in which they could have escaped, the only conclusion is that the old ones did not breed this year. After investigating as far as possible the cause of their failure to spawn this season, my present opinion is they were attacked by a malady that is sometimes found amongst fish, particularly when they are advanced in

pregnancy, in the caking and solidification of the ovaries, by the stoppage of the fluids through the small membranes by which the eggs are connected together and fed previous to their maturity. It is supposed that the cause of this disease is brought about by the close confinement of too many fish within small circumscribed limits, in which they are unable to roam about and partake of sufficient freedom and exercise of body, thus preventing the healthy circulation of the natural functions so requisite at this critical period, or spawning season of the fish. The old bass are apparently all in good healthy condition, and next year we will divide the fish, putting a part of them in another pond, and hope that the result will be more successful.

GERMAN CARP.

The commission has this year supplied about two hundred and fifty applicants with young carp, from four to five months old, and each applicant received from thirty to sixty fish. In most instances these fish have been put in new ponds that have been constructed during the past summer. I think this is evidence that the people of this state are getting thoroughly interested in the question of fish culture, and are going at it in a practical way to test its success or failure. The success of the carp culture is no longer an open question. It is settled, settled definitely in the affirmative, and it will be but a few years before the carp ponds in this state, instead of being numbered by the hundreds, will be counted by the thousands.

The cultivation of fish is destined to become as important among the American farmers and planters as the cultivation of cattle, sheep, swine, poultry, or of grains, fruits, and berries. They have long since ceased to leave the latter to shift for themselves and cope with their enemies, knowing that in such a struggle live stock, grains, and fruits come off second best or succumb.

Fish should receive the same care and attention, both as to improved varieties, artificial propagation, and growth. The practice which farmers will obtain in carp culture will probably open the way to the successful culture of other fish. The hardiness and wide range of diet, and the rapid growth of the carp, especially fit it to be the precursor in fish farming. Every rural community is destined to have

its fish pond in the same abundance that it has its pig pens or poultry yards. This will enable every farmer, however remote from market, to introduce fish into his bill of fare at a very trifling cost. The most encouraging reports continue to come from those who have commenced the cultivation of carp, and some very remarkable instances of the growth of this fish have been reported to the commission, as will be shown by the correspondence which is made a part of this report.

CONSTRUCTION OF PONDS.

The manner in which ponds are to be constructed in any given case, as a matter of necessity, is to be governed by the circumstances as they exist, anything favorable for them to be taken advantage of and turned to good account. A natural valley or hollow may be dammed up at the lower end, thus placing the pond on the top of the ground, so to speak; or it may be made by excavating a hole in the ground, of the required size and depth. The greatest depth of the pond need not exceed six feet, and this to be at the end where the outlet is placed. From six feet at one end, the depth should gradually decrease until the water depth at the head is not greater than one foot. This shallow water is absolutely necessary in a breeding pond. It is of the utmost importance for the durability of the dam to give it the proper degree of consistency and shape. Now suppose the dam is to be six feet high, for example, then the bottom should be eighteen feet wide, and when completed the top should be six feet wide. Make the dam plentifully large, give a good big measure, for a dam never grows any, except like a cow's tail, downwards. What you will consider a very fair, well rounded, fat dam, will in a few years of rain-washing and frost-loosening get to be quite lean and spare-looking. Make it one-eighth higher than you want it when it is settled. As each scraper comes on, pick out all sticks, sods, or stones, or anything that will ever rot and prevent the compact settling. Always use the best dirt to be had in packing around the drain-box or pipe. The drain-pipe is a very important factor of a well-constructed fish pond. Complete control of the water is of prime importance. The drain-pipe should be under the dam, on a level with the bottom of the pond at the deepest place. Dig out a cavity, say four feet square, at the inner end of

the drain-pipe. The bottom of this cavity should be one foot lower than the bottom of the drain-pipe, which should reach to about the center of this cavity. Next drive four stakes of a suitable length firmly into the ground, about two feet apart, in a quadrangular form, then floor this framework with any kind of rough boards, letting the ends project beyond the posts; then side up to the level of the bottom, taking care that the drain-pipe be neatly fitted into the plank; now saw off the four posts two feet above the bottom of the pond; next get a piece of board four inches wide and one inch thick, and cut four pieces four feet long; nail these pieces each way across the top of the four posts, then cover this frame with wire screen of a tolerably coarse mesh, about eight to the inch is the best. The dirt may now be tramped around the bottom of the box, and you have your screen finished. The next is the overflow at the outlet or lower end of the drain-pipe. You require an elbow, and connected with this elbow a short piece of pipe placed in an upright position. The length of this pipe must depend upon the depth of water required in the pond. For instance, if you desire to have the water six feet deep, then you should have the overflow pipe six feet high. This completes the strainer, drain-pipe, and overflow. When you desire to drain the pond take off the upright piece of pipe, and the pond will soon run dry. By this method the drain-pipe is made to subserve both drain and waste purposes, is easily and cheaply constructed, and will give ample satisfaction. It is not advisable to use any wood in making drains under dams, as the wood will soon rot out and the work will have to be done over again. Clay or iron pipes are the best and cheapest. If ponds are made in low ground, where the location is such that the water cannot be drawn off with the underground drain, make a channel through the bank of the pond at whichever side presents the best opportunities. Make the bottom of this channel the same as the highest water level you wish to maintain, but not less than two feet lower than the crown of the bank, and not less than two feet wide, and wider if necessary. Drive a row of stakes one inch apart in a half circle around the inlet to the drain, and not less than two feet from the mouth of the drain on either side. This will keep back all heavy debris. Inside of this drive another row of stakes, fasten your wire

screen, coarse mesh, and be sure the lower ends are well imbedded in the bottom of the pond. If ordinary care is used in the construction of these strainers it will make a comparatively safe flood-escape. Where ponds are supplied by rains only, or with water from a creek, where danger of sudden freshets exist, the inflow of water into the pond should never be allowed to be direct. If the lay of the land permits, make a ditch along the side of the pond, not less than two feet above high water mark, and extending far enough below the dam not to endanger it. The accumulating surface water will be taken up by the ditch and conducted harmlessly away. Make an inlet to the pond through the side of the ditch. The inlet sluice should be so constructed that the inflowing water may be shut off entirely if necessary. It makes but little difference from what source the pond receives its supply. The most important part is to have the water under complete control. If a pond is designed for carp, plant grass seed or some kind of water plant around the edges of the pond and in the shallow places. The grass and water plants make the spawning beds and feed for the fish. It is not absolutely necessary to feed the carp, unless the pond is overstocked; for instance, if the pond has a surface area of one acre, and contains more than five hundred adult fish, then they should be fed on some kind of vegetable matter, either cooked or raw.

If the pond is desired for bass a part of the bottom should be covered with sand or gravel, where the fish can make their nests or spawning beds. Stock the bass pond with shiners and chubs for food for the adult fish. Ponds supplied by springs or cold running water are the only ones suitable for trout, and they will not thrive in any other.

DIRECTIONS.

Brook trout, mountain trout, and salmon trout will be distributed during the months of February, March, and April, and all application for the same should be in on or before March the 1st of each year.

WALL-EYED PIKE

will be distributed in May and June, and applications for the same should be in on or before May the 1st.

BLACK BASS AND GERMAN CARP

will be distributed during the months of October, November, and December.

Tin cans are used to carry all kinds of fish. A ten-gallon can, of the milk-can order, will hold 7,000 brook or mountain trout fry, 5,000 salmon trout fry, 100,000 wall-eyed pike fry, and 100 black bass four months old. Six ten-gallon cans filled with fish is all that one man can take charge of. One of the commissioners or the superintendent usually accompanies such shipments, as the young fish require constant care in transportation. When the fry are taken out in charge of the commission, the applicant will be expected to receive them at his nearest railroad station, with the proper conveyance to carry them to the place of deposit, and plant them with as little delay as possible. In transferring the fish from the can to the pond it is better to sink the can below the surface of the water and allow it to remain so for a few minutes before turning out the fish. This precaution enables them to gradually become accustomed to the change, thus avoiding a shock by the sudden emptying of the can. Fish may be placed in a pond at any time of the day or season of the year, but do not transfer them suddenly from warm to cold or from cold to warm water.

The German carp are the only fish that can be shipped by express with comparative safety. An ordinary six quart tin can, containing five quarts of water and from thirty to sixty carp, can be sent safely by express to any distance which will not require more than thirty-six to forty-eight hours. When fish are sent by express the applicant is required to pay the express charges, and permitted his choice of paying the cost price of the can, or to return it by express to the commission free of charges. The number of fish upon an application will depend upon the number available for distribution. Each applicant usually receives from thirty to sixty carp, from fifty to one hundred black bass, from 2,000 to 5,000 of the brook trout, mountain trout, or salmon trout, and from 100,000 to 150,000 wall-eyed pike.

Before the annual distribution of the different varieties of fish begins, a postal card or letter giving definite information in regard to the

time and manner of the supply will be mailed to each person who has filed an application in time. Applications should be made as early in the year as possible to insure a supply. Applicants should describe particularly the waters to be stocked, giving their names, location and size, and stating whether the bottoms are rocky, sandy, or muddy. It should also be stated what kind of fish, if any, are to be found in the waters. Each person receiving fish is expected to communicate with one of the commissioners or the superintendent from time to time, up to December 31st, the progress the fry seem to be making, so that reliable information can be accumulated as to whether success attends their development in the streams or lakes where placed.

Number and kind of fish eggs obtained by the commission for the year 1886:

Brook trout eggs taken at the fisheries.....	65,000
Eggs received from North Prairie, Wisconsin.....	100,000
Total.....	165,000

Of the one hundred thousand brook trout received from North Prairie, fifty thousand were lost in transit. The package containing fifty thousand trout eggs was shipped by express from North Prairie on the 4th day of January, and did not arrive at South Bend until the 11th day of January. The cause of the delay in transit was occasioned by the snow blockades that occurred on all the western railroads at that time. When the package was opened it was found that the eggs were frozen into a solid mass of ice, and consequently they were a total loss.

California trout eggs donated by the U. S. commission from Baird, trout station, Cal.....	10,000
Lake or salmon trout eggs donated by the U. S. commission from Northville, Mich.....	50,000
Bought of B. F. Shaw, Cedar Rapids, Iowa.....	25,000
Total.....	85,000
Wall-eyed pike eggs obtained at the St. Clair river, Mich.....	16,000,000

We have at this date in the hatching house 100,000 eggs of the brook trout, taken from our stock of breeders the past month, and expect to take 25,000 more by the 1st of January.

NUMBER AND KINDS OF FISH IN THE PONDS AT THE FISHERIES.

Brook trout—Adults.....	1,000
Two years old.....	2,000
One year old.....	15,000
California trout—Two years old.....	2,000
One year old.....	4,000
Wall-eyed pike—Six months old.....	25,000
German carp—Adults.....	306
Five months old.....	3,000
Black bass—Adults.....	47

DISTRIBUTION OF THE FISH DURING THE YEAR 1886.

NAMES OF PERSONS SUPPLIED AND WATERS STOCKED.

BROOK TROUT.

A. S. McCartney, Dunbar, Otse Co.....	5,000
N. H. Chamberlain, Rushville.....	5,000
N. H. Chamberlain, Larrabee creek.....	5,000
N. H. Chamberlain, White Clay creek.....	5,000
W. H. Smith, Bordeaux, for Bordeaux creek.....	5,000
Burr Shelton, Chadron, for Chadron creek.....	10,000
C. H. Smith, Red Cloud, Webster Co.....	5,000
J. F. Prouty, Paddock, Holt Co.....	7,000
A. L. Jennings, Paddock, Holt Co.....	7,000
Wm. Campbell, Glenalpine.....	5,000
J. K. Stout, Louisville, Cass Co.....	5,000
Melvin Holden, Mainland, Cass Co.....	2,000
Carl Myers, Fort Calhoun, Washington Co.....	6,000
Near Valentine in Cherry Co.....	5,000
Near Valentine in Cherry Co.....	5,000
Near Valentine in Cherry Co.....	5,000
Planted in ponds at the fisheries.....	21,000
Total.....	108,000

CALIFORNIA MOUNTAIN TROUT.

Charles Anderson, Potter, Neb.....	5,000
Planted in ponds at the fisheries.....	4,000
Total.....	9,000

LAKE OR SALMON TROUT.

T. Wheeler & Sons, Atkinson, Holt Co.....	5,000
J. M. Johnson, Stuart, Holt Co	5,000
E. Opp, Stuart, Holt Co.....	5,000
S. C. A. White, Bassett.....	5,000
A. H. Bigelow, Cedar Rapids.....	5,000
Clark Puffer. Talmage, Otoe Bo.....	5,000
A. McCartney, Dunbar, Otoe Co.....	5,000
Planted in ponds at the fisheries.....	20,000
Total.....	55,000

WALL-EYED PIKE.

C. W. Kaley, Red Cloud, Webster Co.....	100,000
H. J. Maurer, Red Cloud, Webster Co.....	100,000
Geo. W. Frank, Kearney, Buffalo Co.....	150,000
W. C. Tillson, Kearney, Buffalo Co.....	150,000
J. E. Hill, Beatrice, Gage Co.....	150,000
G. M. Lambert, Bennett, Lancaster Co.....	150,000
A. G. Kimball, St. Paul, Howard Co.....	100,000
G. Babson, Seward Co	150,000
E. S. Johnson, Grafton, Fillmore Co.....	150,000
J. B. Dinsmore, Sutton, Clay Co.....	150,000
Planted in Blue River near Sutton, Clay Co.....	700,000
E. McIntyre, Seward, Seward Co.....	150,009
A. M. Post, Columbus, Platte Co.....	100,000
Planted in Loup river near Columbus, Platte Co.....	600,000
H. G. Teely, Cascade, Howard Co.....	100,000
Geo. H. Hutchinson, Edgar, Clay Co.....	100,000
T. Wheeler & Son, Atkinson, Holt Co.....	150,000

Nelson Andrews, Atkinson, Holt Co.....	150,000
Planted in Blue river near Ayr, Adams Co.....	800,000
Clark Puffer, Talmage, Otoe Co.....	150,000
J. Ragoos, Cass Co.....	150,000
Planted in ponds at the fisheries.....	150,000
Total.....	5,050,000

GERMAN CARP.

Nelson Brown, Waterloo, Douglas Co.....	50
David E. Pray, Lincoln, Lancaster Co.....	40
J. D. Neleigh, West Point, Cuming Co.....	60
Daniel Freeman, Beatrice, Gage Co.....	30
A. F. Garbe, Grafton, Fillmore Co.....	30
J. L. Malleian, Kearney, Buffalo Co.....	60
J. F. Prouty, O'Neill, Holt Co.....	60
Peter Cramer, Kearney, Buffalo Co.....	30
E. S. Johnson, Grafton, Fillmore Co.....	30
L. G. Stewart, Fairmont, Fillmore Co.....	30
O. H. Gillespie, Ainsworth, Brown Co.....	60
J. M. Carp, Bassett, Brown Co.....	30
John McGuire, Blair, Washington Co.....	30
W. F. Rich, O'Neill, Holt Co.....	30
Darwin Smith, Atkinson, Holt Co.....	30
C. Wolverton, Pilger, Stanton Co.....	30
Emil Eickblatt, Scribner, Dodge Co.....	30
R. B. Hunter, Inman, Holt Co.....	30
S. De La Mater, Geneva, Fillmore Co.....	30
G. W. Park, Morseville, Adams Co.....	30
Charles McCoy, Osceola, Polk Co.....	30
John P. Harris, Fairbury, Jefferson Co.....	30
James W. Harris, Fairbury, Jefferson Co.....	30
James Wrigley, Beatrice, Gage Co.....	30
A. C. Montgomery, York, York Co.....	30
A. W. Smith, Shelton, Buffalo Co.....	30
David Gotheridge, Harvard, Clay Co.....	30

C. B. Cox, Odell, Gage Co.....	30
Samuel Miller, Swanton, Saline Co.....	30
J. C. Scott, Valparaiso, Saunders Co.....	30
David E. Fry, Falls City, Richardson Co.....	30
B. C. Birdsell, Greenwood, Cass Co.....	30
Mary S. Olney, Germantown, Seward Co.....	30
W. VanNatwick, Hebron, Thayer Co.....	30
Geo. F. Hutchinson, Edgar, Clay Co.....	30
Theo. Johnson, Fairbury, Jefferson Co.....	60
Israel Beetison, Ashland, Saunders Co.....	30
C. O. Alma, Harlan Co.....	30
J. W. McLain, Hickman, Lancaster Co.....	30
D. C. Dagger, Liberty, Gage Co.....	30
W. M. Trumble, Greenwood, Cass Co.....	30
R. J. Cully, Diller, Jefferson Co.....	30
W. H. Diller, Diller, Jefferson Co.....	30
Jerome Wiltse, Falls City, Richardson Co.....	30
C. B. Camp, Cheney, Lancaster Co.....	30
C. M. McMillan, Red Cloud, Webster Co.....	30
John Imhoff, Crete, Saline Co.....	30
T. J. Bresford, Valparaiso, Saunders Co.....	30
J. L. Harris, Fairbury, Jefferson Co.....	30
H. Myers, Lincoln, Lancaster Co.....	30
R. Dibble, Hoag.....	30
W. J. Fowlie, Bennet, Lancaster Co.....	30
M. H. Sydenham, Kearney, Buffalo Co.....	30
H. Hanson, Wahoo, Saunders Co.....	30
J. L. Blackman, Cheney, Lancaster Co.....	30
T. C. Lassen, Friend, Saline Co.....	30
David Housel, Lincoln, Lancaster Co.....	30
T. J. Mason, Stella, Richardson Co.....	30
W. E. Evans, Stuart, Holt Co.....	30
C. J. Swapper, Stuart, Holt Co.....	30
L. T. Patee, Atkinson, Holt Co.....	30
J. L. Kiff, Hay Springs.....	30
Thomas J. Steel, Wayne, Wayne Co.....	30

S. S. Caulfield, Stanton, Stanton Co.....	30
Charles Peterson, Ogallala, Keith Co.....	30
W. P. Critchfield, Weeping Water, Cass Co.....	30
A. J. Miller, North Platte, Lincoln Co.....	30
Peter Erickson, Scotia, Greeley Co.....	30
C. H. Smith, Red Cloud, Webster Co.....	30
O. B. Shaffer, Hanson, Adams Co.....	30
Jesse Gaudy, Broken Bow, Custer Co.....	30
Andrew McConnell, Trenton, Hitchcock Co.....	30
Ralph Richardson, Red Cloud, Webster Co.....	30
H. Berkley, Tobias	30
Henry Nelson, Beatrice, Gage Co.....	30
Ollie Baughn, Tobias	30
W. G. Lyman, Table Rock, Pawnee Co.....	30
J. L. Evans, Alma, Harlan Co.....	30
Isaac Clark, Tecumseh, Johnson Co.....	30
I. N. Russell, Aurora, Hamilton Co.....	30
W. R. Schleer, David City, Butler Co.....	30
H. C. Timmie, Omaha, Douglas Co.....	30
W. C. Frisbie, Diller, Jefferson Co.....	30
William H. Apsley, Edgar, Clay Co.....	30
Jacob G. Heim, Dawson Co.....	30
J. VanSickle, Kearney, Buffalo Co.....	30
J. B. Allen, York Co.....	30
H. Gocke, Utica, Seward Co.....	50
T. W. Conklin, Table Rock, Pawnee Co.....	60
C. A. Palmer, Hardy, Nuckolls Co.....	30
Chas. O. Lindburg, Lincoln, Lancaster Co.....	30
Thomas Cochrane, Lincoln, Lancaster Co.....	30
E. E. Erfling, Omaha, Douglas Co.....	30
H. Gilkerson, Wahoo, Saunders Co.....	30
J. C. Gilkerson, Wahoo, Saunders Co.....	30
J. M. Griffith, Wahoo, Saunders Co.....	30
J. V. Brady, Kimball.....	30
J. M. Whitted, Florence, Douglas Co.....	50
I. M. Shellenberger, Bradshaw, York Co.....	30

Henry Sievers, Scribner, Dodge Co.....	30
James Baker, Wayne, Wayne Co.....	30
Wesley Raser, Chapman, Merrick Co.....	30
Guy C. Barton, Omaha, Douglas Co.....	30
Ira McConaughly, Superior, Nuckolls Co.....	30
G. O. Adams, Firth, Lancaster Co.....	30
Martin Probst, Plattsmouth, Cass Co.....	40
H. B. Stephenson, Stanton, Stanton Co.....	30
C. W. Kaley, Red Cloud, Webster Co.....	60
H. J. Maurer, Red Cloud, Webster Co.....	60
William Sanders, Ashland, Saunders Co.....	50
Julius Ragoos, Louisville, Cass Co.....	60
Samuel Dunmire, Minden, Kearney Co.....	30
James Bartlett, Newark, Kearney Co.....	30
Mr. Price, Florence, Douglas Co.....	50
A. S. McCartney, Dunbar, Otoe Co.....	50
G. A. Dirks, Fremont, Dodge Co.....	60
S. B. London, Wood Lawn, Lancaster Co.....	30
B. H. Philbrick, Ainsworth, Brown Co.....	30
Superior Cattle Co., Superior, Nuckolls Co.....	50
G. W. Park, Morseville, Adams Co.....	30
James McNett, Germantown, Seward Co.....	30
Clark Puffer, Talmage, Otoe Co.....	40
Louis H. Young, Plattsmouth, Cass Co.....	40
August Baumwack, Louisville, Cass Co.....	50
Charles Diehl, Bennet, Lancaster Co.....	30
D. Gotheridge, Harvard, Clay Co.....	30
H. G. Heilig, Tecumseh, Johnson Co.....	30
J. B. Allen, York, York Co.....	30
Claus Adears, Millard, Douglas Co.....	30
William Adears, " "	30
Henry Carstons, " "	30
H. Hass, " "	30
C. Phal, " "	
H. Gleason, Waterloo, Douglas Co.....	30
R. W. Whitted, Lincoln, Lancaster Co	30

O. H. Gillespie, Ainsworth, Brown Co.....	60
J. G. Bomme, South Bend, Cass Co.....	60
Edward Erb, Lincoln, Lancaster Co.....	30
James Morris, Johnstown, Brown Co.....	60
F. Laudkamer, Alexandria, Thayer Co.....	40
Charles Balback, Omaha, Douglas Co.....	30
Paul Poob, Xenia, Sarpy Co.....	40
Henry Eicke, Omaha, Douglas Co.....	60
C. S. Avery, Omaha, Douglas Co.....	100
J. B. Simkins, DeWitt, Cuming Co.....	30
James W. Harris, Fairbury, Jefferson Co.....	30
D. W. Howell, Ashland, Saunders Co.....	30
Charles D. Richardson, Avondale.....	30
H. F. Frisen, Fairbury, Jefferson Co.....	40
Andrew Ott, Grand Island, Hall Co.....	40
S. W. Bwims, Ainsworth, Brown Co.....	40
Dr. Davis, Tope, Geneva, Fillmore Co.....	40
Edward Scherup, Grand Island, Hall Co.....	40
A. M. Isbell, Liberty, Gage Co.....	40
Alfred McCoy, Trenton, Hitchcock Co.....	40
Hiram Craig, Fort Calhoun, Washington Co.....	30
Fred Isaacs, Burchard, Pawnee Co.....	40
Samuel C. Stump, Falls City, Richardson Co.....	30
S. S. Hardy, Arapahoe, Furnas Co.....	30
G. C. Treeman, Millard, Douglas Co.....	40
Edwin Callan, Pawnee City, Otoe Co.....	40
Jesse Hays, Nebraska City, Otoe Co.....	40
Oscar Hattle, Oxford, Furnas Co.....	40
J. R. Lee, Johnstown, Brown Co.....	40
Otto Gumprecht, Shelton, Buffalo Co.....	30
Clark Cooney, Fullerton, Nance Co.....	100
J. C. Atkinson, Pawnee City, Pawnee Co.....	40
Z. W. Link, Filley, Gage Co.....	30
Peter Saispair, Hooper, Dodge Co.....	30
W. H. Chamberlain, Powell, Jefferson Co...	40
H. S. Valentine, Steele City, Jefferson Co.....	40

A. Hester, Bennet, Lancaster Co.....	50
J. E. West, Beatrice, Gage Co.....	30
W. M. Nash, Ardington, Cedar Co.....	40
W. F. Cody, North Platte, Lincoln Co.....	40
J. M. Bowers, Reynolds, Jefferson Co.....	30
O. S. Gore, Ogallala, Keith Co.....	30
Charles Philpott, Weeping Water, Cass Co.....	40
A. Gunderman, Potter, Cheyenne Co.....	30
J. B. Murray, Beatrice, Gage Co.....	30
De Jay Judson, Inavale, Webster Co.....	40
J. P. Miller, Johnson, Nemaha Co.....	40
James Morris, Johnstown, Brown Co.....	50
John T. Bell, Omaha, Douglas Co.....	30
Geo. A. Clopine, Cortland.....	30
Dr. W. H. H. Kellogg, Greenwood, Cass Co.....	30
J. J. Sierk, Fort Calhoun, Washington Co.....	65
Herman Brundswick, Wisner, Cuming Co.....	40
Leroy Hall, Crawford	60
C. T. Edee, Pawnee City, Pawnee Co.....	40
Frank Pisar, Crete, Saline Co.....	30
Leander Miller, Franklin.....	40
H. C. Goch, Swanton, Saline Co.....	30
S. M. Holden, Mainland, Cass Co.....	40
F. M. Young, Plattsmouth, Cass Co.....	40
F. A. Albee, Arapahoe, Furnas Co.....	40
C. E. Phillips, Indianola, Red Willow Co.....	40
Mr. Schimmer, Grand Island, Hall Co.....	40
Rev. Jos. Hoorka, Schuyler, Colfax Co.....	40
Adam Thomas, Endicott, Jefferson Co.....	40
W. M. Taylor, Salem, Richardson Co.....	40
H. O. Smith, Plum Creek, Dawson Co.....	40
William Bischoff, Nebraska City, Otoe Co.....	40
N. Pugh, Hebron, Thayer Co.....	40
Mrs. A. E. Ellsworth, Steele City.....	40
C. P. Hitchcock, DeWitt, Cuming Co.....	40
John Bockner, DeWitt, Cuming Co.....	40

H. A. Nebbest, Kearney, Buffalo Co.....	40
J. R. Crittenden, Camp Clark.....	40
Wm. D. Watkins, Camp Clark.....	40
Edwin Callan, Pawnee City, Pawnee Co.....	30
Casper Brenn, Swanton, Saline Co.....	40
D. W. Wagner, Salem, Richardson Co.....	40
James Robinson, Germantown, Seward Co.....	40
J. K. Stout, Louisville, Cass Co.....	50
R. E. Hardman, Burchard, Pawnee Co.....	40
E. B. Graham, Harrison.....	40
F. E. Taylor, Ravenna.....	40
M. M. Cobb, Denton.....	40
A. Heinke, Dunbar, Otoe Co.....	40
S. R. Mudge, Beatrice, Gage Co.....	40
Henry Umbland, Eagle, Cass Co.....	40
T. P. Adams, Indianola, Red Willow Co.....	40
Joseph Megli, DeWitt, Cuming Co.....	40
W. H. Chamberlain, Powell, Jefferson Co.....	40
A. C. McKibben, Plum Creek, Dawson Co.....	40
C. C. Craig, Cody, Cherry Co.....	40
G. F. Petty, Logan, Logan Co.....	60
C. E. Brady, Fullerton, Nance Co.....	60
J. C. Truman, Millard, Douglas Co.....	40
Total.....	8,730

STATEMENT OF STATE PROPERTY AT FISHERIES.

The following statement shows the property of the state now at the fisheries, together with its fair value at minimum prices:

Site of 5,202 acres of land with improvements.....	\$2,300.00
Dwelling house.....	1,500.00
Furniture in same.....	500.00
Hatching house and fixtures.....	800.00
Barn and granary.....	400.00
Ice house.....	150.00
Spring house and reservoir.....	150.00
One span of work horses, two sets of harness and two wagons	45.000

Ten large galvanized fish cans.....	\$ 40.00
Eighteen iron-bound fish cans.....	123.00
Two wood-bound fish cans.....	5.00
Twenty small tin fish cans.....	10.00
Thirteen Holten hatching boxes and troughs.....	24.00
One hundred and fifty hatching trays.....	35.00
One hundred shipping trays and boxes.....	30.00
Ten large hatching troughs.....	20.00
Seven small hatching troughs with frames.....	14.00
Six glass hatching jars with attachments.....	18.00
Fifty zinc hatching cans with attachments.....	100.00
One hydraulic ram and connections.....	40.00
Six glass aquariums	210.00
Two seines.....	47.50
Carpenter tools	15.00
One common scraper.....	7.00
One common plow.....	13.00
Four common shovels.....	4.75
Two wheelbarrows.....	5.00
One ice saw.....	4.85
Two pair ice tongs	3.00
One ice hook.....	1.50
One sledge hammer.....	2.65
Three pair plumber's tongs	12.00
One mill for grinding fish feed.....	5.00
One lantern.....	1.00
Trout, carp, bass and pike in ponds.....	2,500.00
Total	<u>\$9,541.45</u>

Adding to this value of twelve ponds with supply pipes
and stone dams..... 3,500.50

And it shows.....\$13,041.95

Available property for use in prosecuting the future work of the commission.

All of which is respectfully submitted.

MARTIN E. O'BRIEN,
Supt. State Fisheries.

The following letters have been received from persons to whom the commission has delivered fish for cultivation as indicated:

BAZILE MILLS, Nov. 28, 1886.

W. L. May, Fremont, Neb.:

DEAR SIR—Some of the town boys were this morning up to the little creek where we planted the young trout you sent me two and three years ago. They were disappointed in not finding any birds, but seeing a (to them) strange fish in the creek, one of them fired. The fish was of a species they had never seen, and they brought it to town as a curiosity. It turned out to be a speckled trout (and one of the most beautiful specimens I have ever seen). I have kept it fresh to-day, and in the morning will express it to you on ice. I wish you could have seen it when first taken out of the water, as it was the most brilliantly marked fish I have ever seen. This must be one of the lot put into the creek three years since, and if so, it has made remarkable growth. There must be more of them in the stream, of course, and I anticipate rare sport hereafter, in which I hope you may be able at some time to come up and share with me.

We planted the carp sent last winter in the mill pond. We forbade fishing in it last summer, so I presume they should have done well, and I look for a large increase from the plant in the future.

I wish you would "put me on your list" for a lot more of both trout and carp; for now that I know they will live and thrive here, I would like to stock some more of our streams up in this country.

Be kind enough to place the fish on exhibition in your store for a while before you "discuss its merits" on the table; for I think it is a fine specimen, and it will help advertise North Nebraska as a good trout producing country.

Yours truly,

GEO. A. BROOKS.

FORT NIobrARA, Nov. 20, 1886.

B. E. B. Kennedy, Esq., Fish Commissioner, Omaha, Neb.:

MY DEAR SIR—I have the honor to acknowledge receipt of your letter of the 15th inst. regarding the growth of trout placed by you and by Commissioner May in the headwaters of the stream which

supplies this post. As I remember, the first planting was by yourself, and was done early in 1884; the second was by Commissioner May in the spring of 1885. Both of these were successful, but the trout from the first, as well as the second, have escaped from the little dam, and, indeed, have found their way below the lower dam.

As late as July last, when we were having the upper dam cleaned, I saw (in said dam) some trout which must have been at least five inches long. I am not prepared to say to which planting these trout belonged, but I can state that in so far as your and Mr. May's experiments are concerned, they were successful. I did not see the fish which I informed you were caught by some of the soldiers of the post early last summer, but I heard that they were about four or five inches in length. I told you, you will remember, that I saw some trout as they escaped from the upper dam (during the cleaning of the latter); these I had the men pick up and put back. They were from four to five inches long, and were firm, healthy, and active. I believe that we would have a fair quantity of healthy trout by next summer were it not for the fact that through cleansing of the dam rendered it necessary to run the water nearly off, but the ultimate escape was very likely due to an accidental break in the dam, which occurred soon after the cleansing just referred to. If I may be permitted to express an opinion touching the matter, I would say that trout culture is not only possible in this vicinity, but that the experiments already made have demonstrated beyond question that they will grow and thrive here.

All that is necessary, therefore, is sufficient planting in any of the streams near here, and in the manner you have adopted, with a reasonable amount of patience for the result. I am, my dear sir,

Yours very truly,

HENRY LIPPINCOTT, M.D.,
Surgeon, U. S. A.

PADDOCK, NEB., Oct. 19, 1886.

Hon. M. E. O'Brien, Supt. State Fisheries:

DEAR SIR—Yours of October 11th at hand, and in reply will say, I am located on a spring branch which flows about half a mile and falls into the Niobrara river. It is composed entirely of springs of

soft water. The stream is from three to five feet wide, and about three feet deep. I formed a pond on one side of the stream, and drew only a small portion of the water through a screen gate, the outlet also being screened. I received from you last spring one can of brook trout, and the next morning after I had received them at O'Neill I placed them in a pond. A few of them were dead, but a large per cent of them were planted in good condition.

During the spring thaw the water found a hole through the dam through which many of the fish escaped into the spring branch. I recaptured some of them and put them back into the pond. The same thing occurred twice afterward and nearly all of the fish escaped. I then allowed those remaining in the pond to go down into the branch, and they are doing finely. They are now about six inches long. Undoubtedly a portion of them have gone into the Niobrara river. I would like to obtain some more young trout next spring if you can send them to me.

Yours respectfully,

L. A. JENNINGS.

RED CLOUD, NEB., Sept. 3, 1886.

Mr. M. E. O'Brien, Supt. Fish Commission :

DEAR SIR—My ponds and fish have thus far greatly exceeded my expectations. The brook trout that I received last spring are all alive and doing finely. The carp are not only alive, but have made incredible growth. I have already three nice ponds, the largest containing four and one-half acres, which I much desire to stock with trout. I would like the different varieties of trout for my ponds. I am about building a still larger pond for carp, though what you sent last fall are doing well, still they are not sufficient to fully stock both ponds; especially as I desire to make fish culture a business. Should like any varieties you might think best to send.

Respectfully yours,

C. H. SMITH.

DUNBAR, NEB., November 8, 1886.

Mr. M. E. O'Brien, South Bend, Neb. :

MY DEAR SIR—The can containing forty-nine carp came to hand all right, and I wish I had five thousand more to add to them. Since

receiving the carp I have drained two ponds, one of them containing twenty-seven carp which I received from you one year ago. They were small minnows then. Now they measure from ten to twelve inches in length. The brook trout and salmon trout that I received last spring are doing finely; in the salmon trout pond there are thousands of small shells all around the edges, something that I never saw before in any of the ponds. Since receiving the carp from you I have made one large pond containing about two acres; part of the water is about five feet deep; now what should I put in it? It is spring water, and is in a beautiful location, and I would like to have it stocked with some good fish. I would like to empty my old pond and turn the thousands of sunfish, black bass and chubs out into the great pond, but I fear the weather is too cold, and it would take a great while to fill up the ponds again. With great faith in the success of the fish culture, I remain,

Yours truly,

A. S. McCARTNEY.

OMAHA, NEB., November 18, 1886.

Mr. M. E. O'Brien, Esq., South Bend, Neb.:

DEAR SIR—In reply to your letter in regard to the 5,000 brook trout put into the South Omaha waterworks lake two years ago, will say that they have done much better than we thought possible for them to do. I took out some in July that measured twelve inches and weighed two and a half pounds. I don't think the loss on the whole plant will exceed five per cent. We have plenty of feed for as many more, and at any time you have them to spare we would be pleased to take them.

Yours truly,

J. F. BOYD,

Superintendent Stock Yards.

JOHNSTOWN, NEB., October 12, 1886.

Mr. M. E. O'Brien, North Bend, Neb.:

DEAR SIR—Your favor of September 22d received. In June, 1885, I received one can of wall-eyed pike, and in October, 1885, one can

of black bass from three to four inches long, and all went in the water alive. I have not seen any of either kind since they were put in the water, but I have faith that in time they will show up in the lake. West of us they have caught several of the wall-eyed pike that were planted there by the commission one year ago. I think most of the lakes near here are well adapted for fish, and the people around here are anxious to have them stocked. Would be pleased to receive any fish that you have for distribution, and will plant them in open waters.

Yours truly,

DAVID HANNA.

HOOPER, NEB., Sept. 27, 1886.

Mr. M. E. O'Brien, Superintendent Fish Commission:

DEAR SIR—Your letter of inquiry received. I cannot tell how many fish I received, but four cans of salmon were put in a lake three miles north of here in the winter of 1880, if my memory serves me right, and I do not know of any ever being caught since. Several cans of pike, and, I think, bass, which were put in Forbes' lake, four miles east of here, have done well. Some fine strings of pike and bass have been caught from the lake. I would like to plant more wall-eyed pike and black bass in Forbes' and Mooney's lakes, as I have great faith in their propagating in those lakes. Hoping the above is a satisfactory reply to your letter and that you will remember me in your next distribution of pike and bass, I remain,

Respectfully yours,

E. VAN BUREN, M.D.

ATKINSON, HOLT CO., NEB., Oct. 4, 1886.

Mr. Martin E. O'Brien, Superintendent Fish Commission:

DEAR SIR—Your letter of September 21st at hand. In reply will say that I have been at your service at all times to assist in the work of stocking our streams with food fish; and all the fish that I have deposited here were placed in as fine streams as there are in Nebraska. After I put the fish in the water I have no further control over them whatever. They then become common property. The brook trout,

salmon trout, and carp that you left here for me to plant are all doing well; and when I get a little time I am going to rig up a dip net and catch some sample specimens to send down to you. You remember the wall-eyed pike you left here; they were so small and transparent that I could hardly see them with the naked eye. They are now four to six inches long, and are very numerous. I spoke to you about fish to put in the Big Sandy, and understood you to say that you would distribute black bass, and that you would let me have some for the main stream.

When you can make it convenient to stop off here, I would like to have the pleasure of taking you around and showing you some of the finest streams of water that you ever saw, and with your help we hope to stock them up with good food fish. I will do my part if the commission will furnish the fish.

Yours truly,

W. A. WHEELER.

WOOD LAKE, Oct. 24, 1886.

Mr. M. E. O'Brien, South Bend, Nebraska:

DEAR SIR—Yours of the 11th instant came duly to hand, contents noted. The wall-eyed pike and black bass planted in Wood Lake two years ago are doing well and growing finely. We would like some more for the spring delivery.

Yours truly,

DAVID LEACH.

RED CLOUD, NEB., Sept. 13, 1886.

M. E. O'Brien, South Bend, Nebraska:

DEAR SIR—In answer to your letter of inquiry, I am happy to inform you that my bass and carp received from you last October surpass my expectations. I placed the bass in a pond four rods in diameter, fed them cleek minnows, tadpoles, and fresh meat, and they have grown finely. In spring and early summer they were decked with beautiful stripes passing around the body, not lengthwise, which gave them a charming appearance. Since very warm weather they

are not nearly so bright, yet they continue to grow, and are now from six to nine inches in length. I would like to put ten thousand young bass in the pond if I could procure them. I am greatly elated with the fifty carp minnows which you sent me the same month. I placed them in a pond about twenty rods square, and saw nothing of them afterwards. In January the snow drifted into the pond and filled it to the very bottom. Severe weather followed, and all declared no fish could live under those conditions, but the last of April my little boys caught several of them with a dip net. They had not grown any. The 15th of June we caught some more of them which measured from eight to sixteen inches in length, a most remarkable growth. They are so friendly as to eat from our hands, after sucking our fingers, thinking they are food. They often make a smacking noise while eating, which my little Nellie interprets as thanks, "cause," says she, "dey has no tongue with which to thank me, so dey des frow kisses at me." They come into shallow water for food, so that nearly the whole fish is visible. There were thousands of the young fry in the pond in July. Thus far my pike have been a complete failure. I think the fry were all dead when they arrived. Would it be possible to procure larger ones which would spawn in the pond? I dislike very much to make a failure of the pike. Hoping my remarks may not be too dull to merit a perusal, I remain,

Yours truly,

H. J. MAURER.

AURORA, NEB., Oct. 27, 1886.

Hon. M. E. O'Brien, South Bend, Neb.:

DEAR SIR—Yours of August 31st at hand. I received about twenty mirror carp from you last fall. They were from two to three inches in length. I saw nothing of them until quite warm weather this summer. I was astonished at their growth; they are beauties, and are from twelve to fifteen inches in length. I had a pleasant visit with them yesterday. They capered lively after the crumbs of bread I threw to them. I am constructing more ponds with the belief that I can make fish culture a pleasant and profitable employment. I supply my pond from a draw which furnishes plenty of

water after a heavy rain. I make good evaporation and leakage by well water elevated by wind mills. Will use a steam pump if necessary, as I cut ice from the pond. Yes, sir, I want more fish, and will send an application soon. I remain,

Very truly yours,

J. N. CASSELL.

RED CLOUD, Sept. 22, 1886.

M. E. O'Brien, Supt. Neb. Fish Commission, South Bend, Neb.:

DEAR SIR—Your favor of the 21st received and noted. In June, 1885, I received a shipment of wall-eyed pike from the Nebraska Fish Commission. My ponds were not in proper condition at that time, and did not understand caring for them, hence lost all of them. The second shipment of pike were received from you June, 1886. For some reason these were dead on arrival. In Oct., 1885, I received from you thirty German carp from two to five inches long. These are doing very well. I have saved most all of them, and they are now from ten to eighteen inches long, and quite tame. They will come up and eat out of my hand. They are a source of great pleasure. I received from you also in Oct., 1885, fifty black bass, from two to three inches long. They are doing very nicely, are growing rapidly. They are now from six to twelve inches long. I am delighted with them and think they are doing well. The bass pond is forty feet by one hundred, with twelve feet of clear spring water; the carp pond is two hundred by four hundred feet, with plenty of water. I am anxious to get more carp and bass. The only trouble with these is that I haven't enough, and am anxious to get more. The ponds are in excellent condition, and so are the fish. My man that is attending to the fish is very much excited over them.

Truly yours,

C. W. KALEY.

COWLES, NEB., September 23, 1886.

M. E. O'Brien, State Hatcheries, South Bend, Neb.:

DEAR SIR—Yours of recent date received. In reply I would say that over a year ago you sent me twenty-three German carp, twenty

of which were living when they came to me. I put them in a pond fed by a strong spring, but last winter the pond froze over, and some of the fish died. What were left did well, and I have a great many young fish. There is no question about the fish doing well here. I expect to make a pond of two acres next summer, and would like to get fish of you to stock it. I have a splendid place for fish, and would like several varieties.

Yours respectfully,

G. A. LOTTA.

FREMONT, NEB., September 11, 1886.

M. E. O'Brien, South Bend, Neb.:

DEAR SIR—Yours of the 6th at hand, and noted. I received of you a year ago the German carp, little ones. I had then one pond. They are all doing well, and are now nine inches long. I have made some more ponds this summer, and have now eight ponds, but seven of them are not yet stocked with fish. I have three small creeks running through my land, which are nearly all composed of spring water. Each pond is about one acre in circumference. I can improve them and make them larger by raising the dams higher. I will do this when I get more fish. I am very thankful to you for the fish I have received, and would like to have some more of them to stock my other ponds. I have seen Mr. W. L. May, and he said that he would come out to see my ponds. I live only five miles south of Fremont, and think that I have a splendid place for raising fish, as the water is running in the creek the year round, and it never freezes. Will write you again after Mr. May has seen my ponds and location.

Respectfully yours,

G. A. DIERKS.

DE SOTO, NEB., November 16, 1886.

M. E. O'Brien, Esq., South Bend, Neb.:

DEAR SIR—As carp raising has become of great interest in this county, I wish to give what little experience I have had with the carp presented to me by the fish commission. My pond is built on Long

creek, which rises in the middle part of the county, running in a northeasterly direction into the Missouri river. The pond covers from six to seven acres of ground. The bottom consists entirely of mud and slime, which is washed down from the hills during heavy rains, giving the carp rich and new feed every time. The water of this pond is also used to supply a water-mill, (with an over-shot wheel), causing the water to rise and fall from one to two feet. Both sides of the pond are used for pasturing cattle. This increases its value for raising carp, because at the time of high water it overflows part of the pasture ground, thus giving the fish a chance to feed on the grass. This is a great advantage to the carp. This pond contained no other fish except a few native minnows which were in the creek at the time the pond was built. Last year during the month of November I put eighty young carp in this pond. Half of them were presented to me by the state fishery at South Bend through Commissioner B. E. B. Kennedy; the other half of them from the United States Commission. This fall in September the mill dam broke through and most of the water in the pond ran out. While at work repairing the dam I caught one of the carp, which, to my great surprise, measured eighteen inches and weighed three pounds. Other carp could be seen swimming close to the surface of the water, which seemed to be of the same magnitude of the one caught. If carp raising can be always carried on with such successful results, it would be of great advantage to many farmers to construct ponds in convenient places and stock the same with carp, as the fish may be obtained without expense by simply making application to the state fish commissioner.

Yours truly,

CLAUS BOWHER,
Washington County, Neb.

ASHLAND, NEB., Sept. 23, 1886.

Mr. E. O'Brien, South Bend, Nebraska:

DEAR SIR—The carp I received from you last October are all right. My pond is not arranged so that I can let the water out, but we can see the fish occasionally, and I should judge that they are now from

seven to nine inches long. I have now got pond number two ready, and would like another supply as soon as you commence to distribute them. I would prefer the scale carp this time if you have them.

Yours truly,

ISRAEL BEETISON.

FREMONT, NEB., Sept. 1, 1886.

M. E. O'Brien, Supt. State Fish Hatcheries, South Bend, Nebraska:

DEAR SIR—Your favor of the 27th inst. is received. I will gladly give you my experience with the German carp which I received last fall through the kindness of Commissioner W. L. May. I received thirty in number, and after placing them in my pond I commenced feeding various kinds of food, principally scraps and crumbs from the table, always feeding them from a given point. I soon got them so that they would appear for their meals as regular as clockwork. I continued feeding them till the pond froze over. This spring I commenced again, but fed them more irregularly and at longer intervals, until the farming season commenced, when I stopped altogether. I believe all the original fish are alive that I got of late. We have seen quite a number of them, and should judge them to be at least a foot in length, a very rapid growth from the small fry they were when I placed them in the pond. My pond is an artificial one; fed by springs, mostly within the pond enclosure. The water in the deepest part is fourteen feet deep. The whole pond covers very nearly one-half an acre. I have a hydraulic ram that takes a greater portion of the overflow from the pond and supplies my barn and yard with water. Another season my intentions are to build another pond below this one, and would like some other variety of fish with which to stock it.

Yours truly,

W. J. HARMON.

NORTH PLATTE, NEB., Elkhorn Ranch, Sept. 10, 1886.

M. E. O'Brien, Esq., South Bend, Neb.:

MY DEAR SIR—Yours of August the 30th at hand, and in reply will say that I had the misfortune to have a break in my dam, thereby losing my carp, which I suppose are now in the stream somewhere.

I saw them several times during the summer just below where the dam was, and they looked fine, and were growing well. I now have my dam fixed in a most substantial manner; have made it so that I can drive over it with a loaded wagon. I have about eight feet of water in it, and it will cover several acres. Now if you will be so kind as to furnish me carp to stock it with you will do me a great favor.

Most respectfully yours,

A. J. MILLER.

PADDOCK, HOLT Co., Oct. 6, 1886.

M. E. O'Brien, Esq., South Bend, Neb.:

DEAR SIR—W. F. Rich and I received the brook trout at O'Neill on the morning of March 5th, and we arrived at our home, twenty-five miles distant, that night about 11 o'clock. The fish were all alive and lively. My trout are making a good growth and look well, except one, which from some cause has its tail grown crooked, and thus cannot swim successfully. Nearly all of them have dark colored tails, but some of them are tipped with white. Which are the males, and which are the females? How many different varieties of fish have you, and when are they distributed, and in what kind of water will they live? We are very much elated with our success with the trout, and are much obliged to you for your promptness in sending the fish, also for the number sent.

Very respectfully,

J. T. PROUTY.

STUART, NEB., Oct. 18, 1886.

Mr. M. E. O'Brien, Supt. Fisheries:

DEAR SIR—Your favor of Oct. 11th at hand, and I will do my best to answer your questions. I received from the commission 5,000 salmon trout some time during last February, and the fish are doing finely and making good growth. We can see them quite often. I think there should be more fish put in the lake each spring until the lake becomes well stocked. I will be glad to plant the fish, and will meet them at the station at any time you may notify me. There are

four other lakes close by that ought to be stocked with fish, and if you will supply the fish I will do the planting. I would like to stock them with black bass, wall-eyed pike, and salmon trout. There is one lake with no fish in it which I think would be a good place for carp. It is similar to the lakes that they used to plant carp in where I lived in Iowa. The lakes are from eight to eighteen feet deep, and the largest one has a surface of about 160 acres.

Yours truly,

J. M. JOHNSON.

SUTTON, NEB., Nov. 15, 1886.

M. E. O'Brien, Esq., South Bend, Neb.:

DEAR SIR—Replying to your circular letter of the 30th of October, I would say that from the best information I have at hand, the wall-eyed pike I received in the early summer from you are doing finely. As they were placed in the Blue river some eight miles from here, and as yet must be very small, I have to trust largely to others for information as to what they are doing.

Yours truly,

J. B. DINSMORE.

BEATRICE, NEB., Oct. 20, 1886.

Hon. M. E. O'Brien, Supt. Fish Commission, South Bend, Neb.:

DEAR SIR—In reply to your inquiry of Oct. 11th, I will say that the first lot of fish received by N. Blakely a few years ago were placed in the Blue river, and since then some of them have been caught. The young wall-eyed pike received during the past summer were carefully placed in the Big Blue, in a place where the water was deep and still, and as the young fish were received in good condition, I am certain they will do well. We appreciate your efforts, and any fish sent us will be tended with care, and we shall be pleased to report any facts connected with their growth. All the fish we receive will be placed in public waters for the food of the people.

Yours truly,

J. E. HILL.

WAHOO, NEB., Oct. 4, 1886.

M. E. O'Brien, South Bend, Neb.:

DEAR SIR—Several years ago we received a small supply of salmon, I think it was, but am not sure; at least the boys that fish in our creek claim to have caught salmon frequently. Last spring the commission sent wall-eyed pike to us, which are doing well. We will be glad to receive any and all supplies you can send us, especially a supply of German carp.

Yours truly,

J. H. GILKERSON.

STELLA, NEB., Sept. 25, 1886.

M. E. O'Brien, Esq., South Bend, Neb.:

I received a letter from you dated August 31st, inquiring about my fish. I have all the carp I need, but will speak for some for a neighbor, T. J. Mason, Stella, Nebraska. He has just completed a fine pond for fish, and would like to get them from the first delivery. I will give you a short sketch of my pond. It covers one acre and a quarter of land; then I have a small hatch pond besides. I received from the state fish hatchery during the month of October, 1885, thirty carp, and nineteen from Washington in November, which measure now from twenty to twenty-five inches in length. Have you any other kind of fish that can be raised with the carp? If so, write me soon. My pond is fed by three springs. I hope to hear from you soon.

Yours respectfully,

J. L. HAYS.

MILLARD, Nov. 15, 1886.

M. F. O'Brien, Esq.:

DEAR SIR—I will write you a few lines about my carp which I received from the state fishery one year ago. They are now from fourteen to sixteen inches long. The mirror carp seem to grow faster than the leather carp. During the months of July and August we feed them on bread crumbs. They are great eaters during these months, but now they will not come up to the surface to feed. The weather is getting too cold, but we can often see them swimming in the water. We have two ponds, about one acre in each. The water is about six feet deep. There is a bank all around the ponds, from twenty to

thirty feet wide at the bottom, seven feet high, and six feet wide at the top. The ponds are fed with spring water, which runs about one hundred rods in a little creek before entering the ponds. The ponds are so arranged that we can drain them. The bottom is muddy.

Yours truly,

GEORGE KARSTENS.

NORTH PLATTE, Dec. 17, 1886.

Mr. M. E. O'Brien, Superintendent Fisheries, South Bend:

DEAR SIR—I should have answered your letter of request sooner, but have neglected it on account of business pressure. I have just finished my fifth lake; I call them lakes because I think it sounds better than ponds in connection with fish culture. This one will contain seven or eight acres, making about fifteen acres altogether. The carp is my favorite. Those I received from the commission in 1882 have grown rapidly. I have a few weighing fifteen pounds each. I will put into the breeding ponds next spring about 100 spawners. I raised this season about 1,000 young carp. I did not put in many spawners this year. If I am not mistaken, you will hear from this quarter good news concerning fish.

I have hundreds of bass in one lake that came from the Elkhorn four years ago. We have had them for the table two years. They are splendid. I turn thousands of them into the North Platte river every year. They multiply very fast. I have land-locked salmon obtained from the state commission. They have hatched the past two years. I can see hundreds of the small ones, from one to three inches long, but cannot get sight of the old ones. I have hundreds of long, slim, speckled fish two or three inches long, but cannot name them. I will sometime send some to you to classify. I keep my carp by themselves until they are over one year old and then let them go in with the other fish. I intend to have the finest fisheries west of the Missouri river in Nebraska.

The carp is an excellent table fish. I regret I did not go into raising the mirror carp a few years sooner. There is both pleasure and profit in it, and while I have not derived great profit thus far, I have taken great pleasure in it. Yours very respectfully,

ISAAC LAMPLUGH.

REPORT
OF THE
STATE VETERINARIAN
AND
LIVE STOCK SANITARY COMMISSION.

DECEMBER 1, 1886.

The commissioners assumed the duties of their office in June, 1885, and organized June 24th of the same year by electing Mr. Geo. W. Barnhart, of Lodge Pole, chairman. Active work was begun at once.

The duties devolving upon the commission necessitated constant traveling, and the holding of eighteen regular and fifteen special meetings, all of which were held at Lincoln.

My appointment as state veterinarian dates from July 8th, 1885, and it is with a feeling of pride and pleasure that I can state that, with the active co-operation of the Live Stock Sanitary Commission, the veterinary sanitary work in this state, although limited, has been a success.

Over twelve hundred communications relating to contagious animal diseases, and quarantine governing the admission of cattle into this state, were received at and answered from this office to date. Being obliged to do all the clerical work of the office, in addition to the necessary and laborious work in the field, in all sorts of weather, the duties of the state veterinarian are fatiguing.

Were it not for the fact that glanders and farcy in horses, and swine plague or hog cholera existed to a great extent in our state, the losses sustained from contagious animal diseases would have been very light.

GLANDERS AND FARCY.

This loathsome and dangerous disease might be said to have existed to almost an alarming extent among the equines of our state. This may be accounted for, to a large extent, because of the prevailing ignorance of the disease among the majority of the practicing, and in many cases unscrupulous, empirics, the traffic in cheap and diseased horses previously tolerated, and by reason of the state having been neglectful of its duty in the past.

Glanders and farcy (*Pferderotz*) are only different forms of the same constitutional disease affecting horses. If a sound animal be inoculated with the matter of glanders or farcy, it may produce either one or the other manifestation, or both. It is highly contagious and incurable. Man, and most animals, take the disease if accidentally or wilfully inoculated, and usually succumb to it. The latent (pulmonary) and chronic forms are the most dangerous, by reason of their obscurity. Both forms are prevalent in this state. They frequently terminate in acute glanders, which is usually ushered in with a slight fever, and the symptoms of the disease becoming more prominent.

The principal symptoms by which glanders can usually be diagnosed are, enlargement of the sub-maxillary gland or glands, a sticky, glue-like, scanty, and continuous discharge, at times streaked with blood, from one or both nostrils, ulceration of a chancreous character on the mucous membrane lining the nose, tumefaction of the nasal cavities, and swelling of the lymphatic glands of the head and legs.

External glanders or farcy manifests itself in the skin of the diseased animal. It is known among the laity as "Button Farcy."

The state authorities up to date caused 309 animals (horses and mules) to be destroyed on account of being diseased with glanders and farcy. Two hundred and eleven were killed by order of the commission, the others voluntarily by the owners.

We are pleased to report that in several localities glanders has been thoroughly eradicated.

To date, four hundred and twenty-six letters were received requesting the immediate examination of horses believed to have glanders. Owing to the numerous other duties devolving upon the commission

and the state veterinarian, the extent of the territory to be covered, and no provision having been made by law to secure expert assistance, one hundred and sixty-six complaints remain unattended to, and in but few instances could reported outbreaks of disease be attended to at once. This state of affairs is to be deplored, and we would most earnestly recommend that the law be so amended as to enable the Live Stock Sanitary Commission, upon the recommendation of the state veterinarian, to employ and secure such expert assistance as may from time to time be required, the assistants to be known as deputy state veterinarians, and to be clothed with such powers as may be necessary for the performance of their duties. The deputies to execute only such orders as may be received from the Live Stock Sanitary Commission, or from the state veterinarian. The additional expense of such assistance would be trifling.

In the appraisement of glandered horses, mules, and asses, we believe we have confined ourselves to the strict letter of the law. Part of section 9 reads thus: "Whenever the commission shall direct the killing of any domestic animal or animals, it shall be the duty of the commissioners to appraise the animals to be killed; and in fixing the value thereof, the commission shall be governed by the value of the animals at the date of appraisement; *Provided*, That no animal or animals shall be appraised except those affected with a contagious or infectious disease of a malignant character, or such as have been exposed thereto. A glandered animal is generally understood to be worthless, but in order to proceed legally a nominal appraisement of one dollar per head was made in almost every instance. We hardly consider such an appraisement as being just, because in many cases, especially so when the animal is afflicted with chronic glanders, the horse to be destroyed may be in such a condition as to be of service to the owner for some length of time, yet the interests of the public demand its immediate destruction. We believe it would be policy to appraise glandered horses at about two-thirds their sound value. This would prevent the secreting of the disease, and greatly facilitate the work of stamping it out, as well as assist many an honest and worthy farmer in regaining a loss which he oft-times innocently sustains at the hands of the authorities. European countries long ago

adopted this policy, and recently several states in the union did likewise, with most satisfactory results.

From evidence received we learn that three persons died with glanders in this state within the past twelve months. They were inoculated while handling horses afflicted with this disease. The horses were destroyed by the commissioners.

SWINE PLAGUE.

During the past ten months swine plague or hog cholera was not so prevalent as in the years of 1884 and 1885, but it still exists to such an extent as to render swine-breeding and cattle-feeding unprofitable. Owing to legal restrictions, and to the limited means at our disposal, it was impossible to do more than make sanitary recommendations to the owners of diseased herds.

The state of Nebraska, with a live stock interest valued at eighty million dollars, a large percentage of which is invested in swine, will in the near future have to give more than ordinary attention to the subject of swine plague.

This fatal disease of swine, at repeated intervals, has infected the herds of the old world, and during the past twenty or thirty years has spread to an alarming extent throughout the United States and Canada, causing financial ruin to thousands of farmers.

To-day the disease can be found in every county in this state, and Nebraska, within the past few years, has suffered a loss of over five million dollars, the greater part of which could have been prevented by the adoption of sanitary measures. During a period of five months the Union Pacific railroad sustained a loss of over twenty-five thousand dollars on one of their branch lines, in decreased shipment of hogs, owing to the existence of this plague in our midst, and the B. & M. railroad a corresponding amount, if not greater.

Swine plague, therefore, at the present time is one of the most important subjects that can be profitably discussed and considered by the coming legislature. It is not only the swine-breeder, cattle-feeder, farmer, and the railroads that are suffering, but every industry as well, causing an indirect loss so great that it cannot be estimated. The

state of Nebraska can no longer afford to remain idle and wait for some one to discover a sure cure for this incurable malady, but must prepare to adopt such sanitary measures as will tend to check and eventually eradicate the disease. With this view I have prepared the subject, and hope I may be able to show clearly how it can and should be done.

The existence of swine plague in Nebraska can be traced back prior to 1871, with a strong probability of having been introduced into the north-eastern counties of this state by sick hogs coming from Iowa. From that section of the state it spread south from one county to another, confining itself to the counties bordering on the banks of the Missouri river, until it crossed the Platte, and then spread in a western direction. After that period the disease abated to some extent, but never disappeared entirely from the state. For the past few years it has again been spreading to such an extent as to cause a loss of from 90 to 100 per cent of the animals attacked, with the aforesaid result.

Swine plague, commonly called hog cholera in the United States, and swine fever in England, is also known by the name of enteric fever of pig, typhoid fever, pneumo-enteritis contagiosa, blue disease, red soldier, anthrax of pig, measles, pig distemper, schweineseuche, etc.

Swine plague is probably the most simple and useful, as well as practical term. It may be defined as an infectio-contagious disease peculiar to swine.

Many years ago it was believed to be a spontaneous and enzootic affection due to local causes, such as bad hygiene and improper feeding.

In the United States its contagious nature was recognized at an early date, and the credit is due to American veterinarians of having discovered its true nature.

Swine plague is said to be no respecter of persons among the pig tribe. It attacks the old, the young, the lean the fat, the scrubs, the thoroughbred, the male and female alike. My experience has been that well-bred animals and shoats are more susceptible to the disease, and that the death-rate is greater among them. This has been attributed to a weak constitution. Full grown animals frequently escape—or, if attacked, recover—while pigs *in utero* often die and are

aborted, or if they survive the period of gestation, they will die as sucklings or remain feeble and puny during life.

I said the disease was infectious and contagious. By this I mean it can be spread through the medium of the air, by fæces, urine, manure, water, food; by animals, such as rats, cats, dogs, rabbits, and poultry; by the boots or shoes and clothing of attendants; by cohabitation of healthy with diseased animals; by inoculation; and last, but not least, by contaminated freight cars and stock yards.

At times, owing perhaps to some unaccountable climatic influences, the disease is not so fatal as at present. Cold weather retards but does not check its spread. It was noticed that during the prevalence of north-east winds the disease would spread more rapidly than usual, and the death-rate increase.

The period of incubation is from four to five, generally from ten to twelve days, and in rare instances from six to seven weeks.

Its duration varies from several hours to a few days or weeks, and occasionally, when it assumes a chronic or sub-acute form, to several months.

The period of convalescence is equally indefinite, lasting from a few weeks to seven or eight months.

During my investigations of this disease, made under the direction of the United States Bureau of Animal Industry, I availed myself of several opportunities to make *post mortem* examinations on so-called recovered cases of swine plague. Five *post mortems* were made on animals that had the disease from six to eight months prior to their being destroyed for examination. The animals were apparently healthy; in fact they appeared so to such an extent that expert stockmen, as well as myself, failed to pick them out when requested to do so. In every case the lesions of swine plague were present. I consider the fact of great importance, and believe that such animals, if introduced into healthy herds, will communicate the disease, and will account for a number of so-called sporadic outbreaks.

The symptoms are—loss of appetite, cold shivering, lasting from a few minutes to several hours, sneezing, more or less coughing, rise in the temperature of the body from two to four degrees, increased pulse, staring condition of the bristles, drooping ears, stupidity, loss of vi-

vacuity, sometimes vomiting, a desire to isolate themselves and lie down in quiet, warm, and dark places, injected condition of the eyes, accumulation of mucus in the canthi of the eyes, partial blindness, more or less copious, at times bloody, nasal discharges, dizziness, increased thirst, labored as well as hurried respiration, constipation, frequently followed by diarrhœa (if diarrhœa is present the fæces are semi-fluid, pasty, and of a dark green color, oftentimes streaked with blood), the urine is scanty and frequently high colored, the exhalations and excrements have a characteristic and peculiar odor, which at times is so penetrating as to announce the presence of the disease. The animal rapidly emaciates, and frequently betrays a depraved appetite for dung, urine, dirt, and saline substances. They are frequently found lying down, and when compelled to rise and move about they do so unwillingly, moving with a weak, staggering, slow, and stiff gait. There is a swelling of the head, eruptions in the ears and other parts of the body; the skin in many instances is hard and dry, the voice becoming faint, peculiar, and hoarse; the animal manifests great indifference to its surroundings, and an extremely offensive diarrhœa, associated with general debility, marks the slow approach of a slow and fatal determination of the disease; death ensues under convulsions; in some cases a cold, clammy perspiration breaks out all over the body. In those few animals which recover the cough becomes more frequent, the fetid smell of the fæces disappears, the animals become more lively, and slowly gain flesh and strength, notwithstanding that a hacking cough continues a long time.

The *post mortem* lesions are seated in different parts of the body.

The blood is frequently very dark in color, and thick; it may also have a tarry appearance, and always coagulates on exposure to the air.

In the thoracic, abdominal, and pericardial cavities effusions of serum, varying in quantity, are common. On the serous membranes deposits of lymph are frequently seen.

The lymphatic glands, especially the mesenteric, hepatic, and bronchial groups, always present characteristic lesions. They are universally enlarged, dark in color, infiltrated with blood, and friable.

The lungs are more or less extensively infiltrated, at times to such an extent that portions thereof, if thrown into water, will sink. This

degree of consolidation is dependent upon the duration of the disease. In animals where the disease had progressed slowly, the red, brown, or gray hepatizations are common. Adhesions of the lung to the wall of the chest and cheesy tubercles are frequently found. The trachea and bronchial tubes are filled with a frothy mucus.

The heart is generally softened, flabby, dilated, and at times congested. In chronic cases the pericardium (the membranous sac enclosing the heart) is frequently found firmly and completely adherent to the heart, small portions of which can be detached by careful manipulation. Ecchymosed spots, described as being common on the endocardium (the lining membrane of the heart) I have seen but rarely.

The intestines are usually inflamed, especially a portion of the small ones (jejunum), and numerous peculiar growths or ulcers, varying in size and shape, are prominent in a portion of the larger (the cœcum and colon). The size of these growths varies from a pin's head to a quarter of a dollar, and the color varies from a yellow to a grayish brown and blackish. They are usually imbedded upon the mucous membrane, but at times perforate the walls of the intestines. The mesentery and omentum are generally congested.

The liver has a mottled appearance, is often congested, as well as soft and pulpy. The gall bladder is filled with a semi-solid, granular, dirty brownish substance. The spleen is dark colored and soft, frequently pulpy.

The kidneys exhibit no very marked change to the naked eye. Its capsule can be easily removed.

Treatment for swine plague cannot be recommended, and it should never be attempted, as it does not pay.

INOCULATION.—In order to appreciate and thoroughly understand inoculation, it is necessary to mention that swine plague is produced and spread by a germ called the bacillus suis, a minute organism, microscopic in size, and described to resemble a short rod with rounded ends, being darker at each pole. It is found in all the fluids and tissues of an animal affected with this plague, and never in healthy animals. This germ has been successfully attenuated (that is, weakened and impaired) by several veterinarians, so that it now can be introduced into healthy animals without danger, producing in them a

mild form of the disease, after which it is claimed that they acquire immunity, or if they take the disease, it will develop in a mild form only.

Inoculation for this disease has been successfully performed by Prof. Law, by Klein, and others, with a modified virus; but whether the inoculated animals afterward were proof against the invasions of the disease I never learned.

Early in October, 1885, through the kindness of Prof. A. Liautard, I was furnished with *rouget* virus, procured from Pasteur's laboratory in Paris. At that time it was believed by several veterinarians, among them myself, that *rouget*, the disease of swine in France, and our swine plague were identical. I notice in English veterinary journals that there also eminent members of the veterinary profession believed *rouget* and swine fever to be one and the same disease.

On November 2d, 1885, I inoculated twenty-six pigs, varying in age from five to six months, at the college farm, with what is called the first vaccine, and with the second vaccine ten days later. The inoculated animals were exposed to the ravages of the disease in January. With what result is well known. The animals succumbed to the disease perhaps a little quicker than if they had never been inoculated. Dr. D. E. Salmon, Chief of the U. S. Bureau of Animal Industry, is entitled to the credit of having been the first veterinarian in this country to demonstrate that our swine plague and the *rouget* of France are two different and distinct diseases, thereby explaining the failure of "*rouget* virus" in protecting the inoculated animals from swine plague infection.

PREVENTION.

How can we get rid of the swine plague in this state? I will answer this question briefly, and state that until the benefits to be derived from inoculation have been thoroughly tested, it is absolutely necessary that every animal diseased with swine plague be killed and cremated, and all others that have been exposed thereto be slaughtered, under the supervision of an inspector; the enforcement of effective quarantine regulations, and a compulsory disinfection of all infected places. Such measures, though harsh, will enable the authorities to cope with the disease successfully, and eventually stamp it out.

CONTAGIOUS PLEURO-PNEUMONIA OF CATTLE, AND QUARANTINE REGULATIONS.

Contagious pleuro-pneumonia of cattle, since its introduction into this country (Brooklyn in 1843), has spread uninterruptedly, so that now it is of common occurrence in most of the Eastern and some of our Western states. Its contagiousness, its insidiousness, its long duration, and the constant danger from so-called recovered cases, that even the most experienced of inspectors fail to detect it at times, the ruinous experiences of continental Europe, Great Britain, and Australia from this disease, the inability of the authorities to cope with it successfully at Chicago, the very threshold of the greatest cattle market in the world, are facts so well-known that it will not be necessary here to give a detailed description of the disease or the ruin that invariably follows its introduction into a new and uninfected country. In a state like ours, that is still free from the disease, what steps would not be justifiable in lessening our risk of importing the disease and in giving us absolute protection?

The quarantine proclamations issued by Governor Dawes, prohibiting the importation of cattle into the state of Nebraska, coming from the states of Pennsylvania, Connecticut, New Jersey, Delaware, Maryland, Virginia, West Virginia, Kentucky, Tennessee, Illinois, and the District of Columbia, excepting under such rules and regulations as shall from time to time be prescribed by the Live Stock Sanitary Commission of this state, and the enforcement of the latter (almost iron-clad rules), greatly reduce the chances of our state becoming infected, but cannot render the state absolutely safe. No state that has so far escaped this worst of all calamities to the cattle industry can feel safe until Congress has enacted a law regulating the movement of all diseased, suspected, or exposed cattle within an infected district, and prohibiting the movement of all cattle out of said district, except on permit issued by a U. S. government inspector, until contagious pleuro pneumonia has been stamped out, and the district declared free. When this is done, every state can and will remove the present obstructions so embarrassing to the cattle traffic, arising from the vexatious local quarantines proclaimed by the different states. Still, in the

absence of such law, and considering the danger threatening our cattle industry from numerous sources, the importance of maintaining quarantine, and rigidly enforcing the rules and regulations governing the admission of cattle into this state, cannot be overestimated.

The following rules issued by your Commission, September 28, 1886, are now in force:

RULES AND REGULATIONS GOVERNING QUARANTINE AND THE
ADMISSION OF CATTLE INTO THE STATE OF NEBRASKA.

First—All cattle coming into the State of Nebraska are required to enter the State at Omaha, Plattsmouth, Blair, Falls City, or Covington, where they must be unloaded for inspection.

Second—All owners of cattle coming into this state from localities quarantined against, will be required to furnish the following evidence that their cattle are free from disease:

(A) Affidavit of two disinterested parties that have known the cattle in question for a period of four (4) months prior to the date of shipment, that they have been healthy and exposed to no contagious disease, and that no contagious disease is known or believed to exist in the county from which they came.

(B) Certificate of county clerk of said county that parties making such affidavit are responsible and reputable citizens of the county.

(C) Affidavit of owner, or person in charge, made at point of entry, that his cattle are the identical cattle described in the foregoing affidavits, and that the shipment has been direct and without unloading except for food and water, and in cleansed and disinfected cars.

Third—Owners or persons in charge of cattle from localities not named in Governor's proclamation, must certify under oath, that such cattle have been kept in one state for a period of four months (giving name of town and county of said state) and have not been exposed to any contagious disease for a period of three (3) months from date of shipment.

Fourth—All the foregoing evidence to be submitted at the point of entry to the Live Stock Sanitary Commission, State Veterinarian, or an authorized Inspector of the state; when permit for shipment may be issued.

Fifth—Dealers' calves gathered in quarantined states will be quarantined at points of entry.

Sixth—Cattle not receiving permits for shipment and retained in quarantine, will be held at owner's risk and expense.

Seventh—All cattle arriving at points of entry are inspected free of charge to owner.

Eighth—No railway company doing business in this state will receive for shipment into this state any cattle unless accompanied by a permit signed by an authorized inspector.

All railways doing business in this state, as well as the owners of ferries, are complying with the rules.

Instructions were forwarded to all inspectors at points of entry, requesting them to rigidly enforce the rules, and examine carefully into the history of all cattle arriving. They were also instructed to examine horses and mules for glanders and farcy.

The inspectors are employed and paid by the railway companies; the appointments being made subject to our approval. This condition is undesirable, and we hold that in all fairness they should be paid and employed by the state, believing that by so doing the service will be more thorough and efficient.

NAMES AND LOCATIONS OF INSPECTORS.

W. A. Thomas, B. V. M., Inspector for B. & M. R. R. at Lincoln.

Wm. Jones, V. S., Inspector for B. & M. R. R. at Plattsmouth.

John Noonan, V. S., Inspector for Mo. Pac. Ry. and B. & M. R. R. at Falls City.

Dr. H. L. Ramacciotti, Inspector for U. P. Ry. at Omaha.

Dr. G. M. Osborne, Inspector for F., E. & M. V. R. R. and S. C. & P. R. R. at Blair.

John Airth, M. R. C. V. S., Inspector for C., St. P., M. & O. Ry. at Covington.

The inspectors, in many instances, were obliged to hold and turn back cattle coming from quarantined states on account of the owners not being able to furnish the necessary certificates and affidavits. Glandered horses were also discovered in many instances.

TEXAS FEVER.

The loss sustained from this disease alone, in an outbreak in the western portion of this state during the summer of 1884, was estimated at fifty thousand dollars.

At the request of the Commission the following proclamation was issued:

QUARANTINE PROCLAMATION.

EXECUTIVE OFFICE,
LINCOLN, NEBRASKA, March 18th, 1886. }

WHEREAS, The disease known as Texas or Splenic Fever is common among the cattle of various Southern states, and

WHEREAS, Danger to the live stock interests of Nebraska is apprehended from the introduction of cattle affected with said disease, and

WHEREAS, The Live Stock Sanitary Commission of the State of Nebraska, at a meeting of said Commission held at Lincoln on the second day of March, 1886, adopted the following resolution:

“Resolved, That the Governor be requested to prohibit by proclamation the entering into the State of Nebraska of all cattle that have been shipped all or any part of the way from the states of Texas, Arkansas, Louisiana, Alabama, Mississippi, Florida, Georgia, Tennessee, North Carolina, and South Carolina, during the months of April, May, June, July, August, September, and October.”

NOW THEREFORE, I, James W. Dawes, Governor of the State of Nebraska, under the direction of the foregoing resolution, and by virtue of the authority vested in me, do hereby issue my Proclamation, declaring and establishing quarantine and prohibiting the entry into the State of all cattle that have been shipped all or any part of the way from all or either of the above named places, except under such rules and regulations as may be prescribed from time to time by the Live Stock Sanitary Commission of this State.

The quarantine so declared and established will be enforced by the Live Stock Sanitary Commission, and State Veterinarian.

IN TESTIMONY WHEREOF, I have hereunto set my hand, and caused to be affixed the great seal of the State of Nebraska.

Done at Lincoln, this eighteenth day of March, A.D. 1886.

JAMES W. DAWES.

By the Governor:

[SEAL] E. P. ROGGEN, Secretary of State.

Similar precautions were taken in 1885.

The protection afforded by this proclamation far exceeded our most sanguine expectations. With the exception of three heifers, that in all probability contracted the disease at a public stock yard of some other state, or in an infected car, and died at Lincoln, no losses occurred within the past two years. This result speaks volumes in favor of sanitary regulations when properly applied and enforced.

The quarantine thus established was violated in but one instance. A Mr. Richards, of Chadron, imported 11 head of Jersey grade heifers, shipped from Wilcox county, Alabama. They arrived at Chadron June 8th, 1886, coming into the state over the Missouri Pacific Ry. Whether the owner, or the railway company, or both, are to be considered guilty of violating the law has not been ascertained as yet.

Early in September, one bull, two heifers, and two cows, that had come into contact with the Alabama cattle, died. Dr. Hopkins, Territorial Veterinarian of Wyoming, was notified (the owner did not know the address of the State Veterinarian of Nebraska), and requested to make an examination. In company with Dr. Hopkins, an examination of the cattle was made on Sunday, September 19th. One sick animal was found, but as it did not exhibit several of the symptoms commonly found in Texas fever, a positive diagnosis could not be made. The history, however, indicated the probability of its having been that disease. As heavy frosts had already put in appearance, we did not apprehend any danger, and returned home, satisfied that in one instance the law of Nebraska had been disregarded.

OTHER DISEASES.

Anthrax (Charbon. Milzbrand). This is a germ disease. The germ is known as "*Bacillus anthracis*." Five mild outbreaks of

this disease among cattle came under our notice, the number of deaths in each outbreak being small. The owners were advised to change pasture, feed, and water, and keep them on a laxative diet for a few days. The result from such change was most beneficial, no further deaths occurring.

RABIES.

With the exception of one case in a dog and a horse at Lincoln, and of an outbreak among horses at Kearney, reported by the Commissioner and by Dr. Ramacciotti of Omaha, no other authenticated cases came under our observation.

The symptoms of rabies, as manifested in a dog, are usually of interest to the public. In this animal the disease is known as *rabies canina* (hydrophobia). It is transmitted to man through the bite of a *rabid* dog, the medium being the saliva. Rabies of a dog in its first stages does *not* manifest itself by raving madness, as the public is inclined to believe. On the contrary, it is a disease of a mild type at first, the dog being very affectionate and having no desire to bite. The saliva, however, is virulent from the first, and the dog thus becomes dangerous by his affections. During this, the incubative stage of the disease, the saliva contains the germ which does inoculate hydrophobia to man and other animals. The mad dog has a great desire for water, and satisfies his thirst by drinking as long as he can, until the spasms of his throat prevent swallowing. A rabid dog does not *fear water* as is generally believed. In the second stage there is an expression of ferocity in the countenance of the animal affected. It is during this stage the mad dog has a great desire to bite, and when at liberty attacks all living beings he encounters, but always prefers to attack dogs. During these paroxysms of rage, the dog will even try to satisfy his desire by biting inanimate bodies. He gnaws the wood of doors and furniture, tears carpets, curtains, slippers, chews hay, straw, hair, wool, eats earth, small stones, etc. The voice of the animal becomes wonderfully modified in its expression; his barking is entirely different from its former tone; the abundance of the flow of the saliva is increased during a paroxysm. The mad dog that dies by the natural course of the disease, finally succumbs to paralysis and

asphyxia. To the very last the dog has a great desire to bite, and he must therefore be feared, even if apparently rendered inert by exhaustion. The safest way of preventing inoculation from the bite of a rabid dog, is by immediate cauterization of the wound. The sooner this is done, the greater the protection. As the only cause of hydrophobia is its transmission by the bite of a *rabid* dog, all bitten dogs, and those suspected of having been bitten, ought to be destroyed immediately, or else safely caged until a diagnosis can be made by a competent veterinary surgeon. All other dogs should be well muzzled, and wear collars with the owner's name and address upon them.

EPIZOOTIC OR INFECTIOUS ABORTION.

No reports of this disease, so common among the dairy cows in our Eastern states, causing serious losses to the farmers, were received at this office.

TRICHINOSIS.

To what extent this disease exists among the hogs of Nebraska is not known. The microscopic examination of several thousand hogs, which would enable us to get at a percentage, is desirable.

The disease is produced by a very small worm, called *trichina spiralis*, found in the flesh of swine. This microscopic entozoa was first described and named by Prof. Owen, of London, in 1835. Hogs are not born with this parasite, but probably get them by eating the meat of some other infected animal. Where trichinæ originally came from is not known. It will suffice to know that trichinæ are commonly found in the meat of swine, scattered among the muscular fibres (muscle trichinæ), where one or two are enclosed in a cyst, composed principally of lime salts. If some of this infected meat is eaten by man or animal, the various cysts enclosing the trichinæ readily dissolve during the progress of digestion, whereby the parasites are liberated. The females are more numerous than the males, and in a few days they become mature. The male is 1.50 mm. in size, and the females about 3 mm. After being liberated copulation soon takes place. The female becomes pregnant, and in six (6) days gives birth to living young. This continues about five (5) weeks, in which time

each female has given birth to about 1,000 young or more. These young (intestinal) trichinæ immediately commence to migrate from stomach and intestines into the muscles of the whole body. The period of migration ceases in four (4) weeks, by which time they are fully grown. They then assume a spiral shape, and after being enfolded by capsules remain inert, lime salts being gradually deposited into each capsule until they finally become hard. It is believed that they can maintain their vitality in this condition for fourteen (14) years. While they are migrating over the entire system they produce an intense itching of the intestines and muscles, thereby causing a diarrhoea and myositis. Intestinal trichinæ are always found in the fæces of persons and animals suffering with trichinosis. The encysted muscle trichinæ are most common in the pillars of the diaphragm. The only protection against infection is thorough cooking of all pork. Salting and smoking does not always destroy the vitality of these parasites. Raw ham or sausage should never be eaten. A boiled ham, if large, often contains living trichinæ near the bone, owing to the slowness with which boiling heat penetrates meat.

RULES FOR DISINFECTION.

Too much care cannot be taken towards the prevention or spread of the disease, and nothing should claim more attention in the warding off of the disease than cleanliness combined with fresh air. Fortunately in this state we have room enough, so that stock need never be crowded into poorly ventilated barns or yards.

To disinfect your buildings, etc.: The premises should first be vacated, and entirely cleansed of manure or other refuse, including fodder, litter of every kind which may cover up the infected matter, and should then be thickly sprinkled with Labarraque's solution (chloride of lime) or drenched with a solution of the same in the proportion of one-quarter pound of the fluid to one gallon of water. All wood-work, fences, mangers, racks, etc., should be washed with the same solution after buildings have been thoroughly cleansed from manure and all other refuse; if they have wooden floors, they should be taken up and about six inches of the soil underneath removed. The walls should be carefully scraped, and the refuse, including the planks,

removed. All useful timber should be carefully washed with the same solution of chloride of lime, to which might be added as much quick lime, which will make a thin whitewash; this will show the smallest portion of surface, should any be missed in making the application. Gutters, spaces beneath the floors, and all woodwork, including stable utensils, must be thoroughly drenched with this solution. After a building has been thoroughly disinfected in this careful manner, it should be tightly closed up, so as to exclude the outer air as far as possible, and fumigated with the burning of roll sulphur* or sulphur bricks†.

To fumigate a barn, break up the sulphur in small particles place them in an iron plate or other metallic dish, set it on fire, then leave, shutting the door after you. A pound of sulphur should be sufficient for 1,000 cubic feet of space. Keep the barn closed at least three hours after the burning has ceased, then air it well for several days by allowing all doors and windows to be thrown open.

All manure or waste from places occupied by suspected or diseased animals, and also that furnished by cars, trucks, wagons, buildings, and vessels should be burned, if possible. Litter, fodder, hay, and straw should be used cautiously. To disinfect robes, grain bags, blankets, and all textile fabrics, including ropes used about suspected animals, boil in a solution of carbolic acid (two ounces of the acid to one gallon of water), or they can be just as effectually fumigated with sulphur as described above.

To disinfect railroad cars: After they have been cleansed by scraping or brushing out all the filth and scrubbing with boiling water, use Labarraque's solution of chloride of lime, as is described in disinfecting yards and barns, then apply hot steam thoroughly.

THE PRESENT LAW.

The act concerning the care of, and to prevent the spread of contagious and infectious diseases among domestic animals; to provide for the appointment of a Live Stock Sanitary Commission, and State Veterinary Surgeon, defining their powers and duties and regulating

* If roll sulphur is used, a little alcohol should be added before setting it on fire.

† Manufactured by Parke, Davis & Co., Detroit, Michigan.

their compensation, has very few defects, and if a few judicious amendments, such as suggested in the report, be added, the present law can be made the best in the United States, and will not only enable this body to prevent the introduction of contagious animal diseases, and to control those that are now prevalent, but will also facilitate the work of stamping them out.

To carry out this work successfully, an annual appropriation of one-half of one mill will be necessary.

EMERGENCY FUND.

In considering the difficulties encountered by the Illinois authorities in controlling the outbreak of contagious pleuro pneumonia at Chicago, owing to the lack of funds, it is suggested that it would be wise for the legislature to create a special or an "Emergency Fund," to be drawn upon only with the consent of the governor, secretary of state, and attorney general under similar circumstances.

Respectfully submitted,

GEO. W. BARNHART,
JAS. C. BIRNEY,
D. D. JOHNSON,

Members of Live Stock Sanitary Commission.

J. GERTH, JR.,
State Veterinarian.

THE GRASSES AND FORAGE PLANTS OF NEBRASKA.

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I. THE FORAGE PROBLEM OF NEBRASKA.

Another year of study and observation of the forage problem of Nebraska permits its somewhat more authoritative discussion. I must warn you, however, at the outset, that a problem involving so many factors, and having to do with so great an area as that of Nebraska, cannot be satisfactorily solved in a few months' time, or even by a year or two of careful work. One of the disturbing factors in the problem is that connected with the gradual change in climate which the country of the great plains appears to be undergoing. That such a change is taking place appears now to be pretty generally believed by the older inhabitants of Nebraska, and I am myself convinced that the climate has undergone some modifications within the last thirty years. That which we call climate includes many things, and is dependent upon a multitude of influences and conditions, all of which are variable, and many of which are more or less under our control. These plains were originally treeless. The winds swept over the heated earth in summer for hundreds of miles, unchecked by any cooling groves. As it rolled down the great slope, and became more and more heated, by a well-known law of physics it became drier. It dried still more the parched earth, and this, in turn, heated and dried the air which followed.

Were these plains covered by forests from the Rocky mountains to the Missouri river, with every other condition unchanged, the much-talked of dryness of the summer air would no longer exist. The plains are dry because they are treeless, because the summer air sweeps over the surface of the soil heated by the unbroken rays of the sun. Shade the soil with the spreading branches of forest trees and orchards, with the foliage of tall grasses and grains, with the luxuriant vegetation of Indian corn, and the summer winds will no longer roll





PLATE II.—KENTUCKY BLUE GRASS (*Poa pratensis*).

down these plains with the fierce, dry heat of the sirocco. This is one way in which the climate of Nebraska is being changed—slowly changed it is true, but still certainly changed.

I have not the time, nor is this the proper place, in which to take up the further discussion of the question of the change of climate within the last thirty years in Nebraska. Suffice it for present purposes to say that the climate is changing, and that the direction of that change is towards a condition of greater moisture in the summer air, with a correspondingly larger summer rainfall. I cannot refrain, however, from briefly referring to the fact that a change is taking place in our winter climate also, and that it is due to similar causes. Originally the winter winds swept these plains with nothing to veer or check them. Here was the home of the blizzard. Here the icy blast, filled with frosty snowflakes, swept over the frozen face of the earth. The snow cut through the air horizontally and drove mile after mile over the plain. But now in every grove of trees the snowflakes fall as gently to the ground as they used to upon the forest-covered hills of New England. While the roaring blizzard still rages upon the open plain as fiercely as of old, his power is broken wherever the provident settler has planted a grove of forest trees. When this fair state has groves enough all over its surface, the biting blast of the blizzard will no more be known.

There is another varying factor in this forage problem. We do not yet know what kind of an agriculture will eventually be followed here. Is it to be the cultivation of small farms, upon which grains and grasses are to alternate in an orderly rotation of crops? Is it to be the growing of Indian corn, and the fattening of swine? Is it to be dairy farming? Is it to be, in the western part of the state, the fattening of great herds of cattle for beef? These varieties of agriculture require different forage plants. Probably all, with still others, will be followed in different parts of the state, requiring a special solution of the forage problem for each locality. With these preliminary considerations let us now pass to the discussion of some practical questions.

(a) *What old forage plants are valuable in Nebraska?*—The farmer coming from the Eastern states naturally turns to the old and tried

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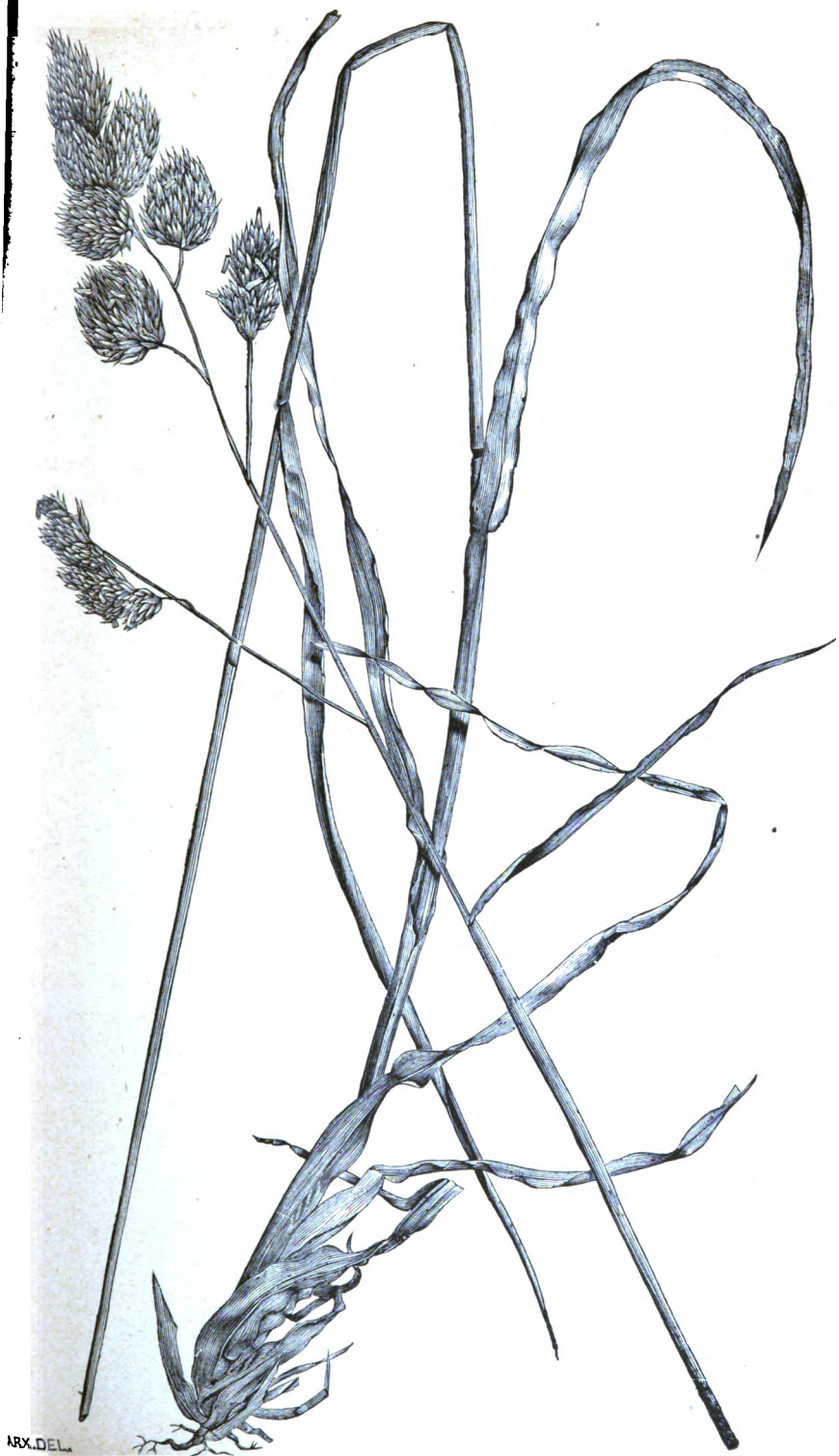
forage plants for growing upon his Western farm. But he has been told over and over again that he must abandon all the old familiar kinds, and accordingly he has been making experiments with a number of new-fangled things, many of which are the abandoned or rejected plants of other and older countries. It is doubtless a good thing to "prove all things," but it is a still better thing to "hold fast to that which is good," and while the agriculture of Nebraska may have gained something by making experiments upon various greatly lauded forage plants, it is quite certain that it lost much by not holding fast from the first to the good old grasses and clovers which have stood the practical test of use upon the farm for a century or more in other agricultural countries.

It is possible that at the first the soil of the plains would not have grown the old forage plants as it will now. It may be that the climatic changes of the last thirty years have been such as to make it possible for the farmer to grow to-day forage plants which could not be made to thrive at the beginning of the period. Let us make all allowance of this kind; let us not appear to lay blame upon the pioneers who first ventured to make farms upon the great plains.

To-day it may be said, without fear of successful contradiction, that the old forage plants of this latitude in the states to the eastward of us will grow well in Nebraska. Allow me to particularize as follows, viz.:

Timothy (*Phleum pratense*).—This exceedingly valuable grass has been successfully grown in so many places in the eastern part of the state and so far up the Republican and Platte valleys, that we can say with certainty that it is at home on our soil. No one who examined, even casually, the exhibits of grasses from the western counties, made at the state fair in 1886, can any longer entertain a doubt as to the future of timothy in this state. Samples were shown from Valley and Kearney counties, many of which were equal to the best I have ever seen anywhere. I have during the past few years become reasonably familiar with what Nebraska soil and climate can do, but I must confess to having been much surprised at the size of heads and the general excellence of the timothy shown by the western counties.

In another matter I have been agreeably surprised, and that is, in



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PLATE III.—ORCHARD GRASS (*Dactylis glomerata*):



PLATE IV.—LITTLE BLUE STEM (*Andropogon scoparius*).

finding that timothy will grow well upon much of the upland soil. That it should thrive upon the lowlands was not unexpected after the results of the first attempts were known, but that it should grow well upon the higher lands was not looked for, and it is yet not known to many a farmer in the state.

Moreover, on the moister soils timothy is not only valuable for hay, but in such situations it becomes a tenacious pasture grass, enduring the cropping of animals so well as to enable it to furnish continuous pasture for many years.

Kentucky Blue Grass (*Poa pratensis*).—The range of this valuable pasture grass in the state is about the same as that of timothy. Away up the Platte river, about the old forts and government stations, Kentucky blue grass has been growing for many years, and demonstrating in a practical way its adaptability to the soil and climate of the state. The rich bottom lands of the eastern counties have long since shown their power of growing this grass in perfection, and even upon the middle lands between the river bottoms and the high "divides" it thrives most promisingly. Although affected by the midsummer drought, for early and late pasturage there is no other known grass which equals it. As I have pointed out in papers read before this society, blue grass is valuable not alone for the *quantity* of forage it furnishes, but also for its most excellent *quality*. It is rich in flesh-forming materials, and is one of the most valuable green foods which a cow or an ox can feed upon.

Red Clover (*Trifolium pratense*).—This old and tried forage plant, which produces more food per acre than any of its rivals, was long thought to be unsuited to the conditions which prevail upon the prairies and plains of the West. Many a farmer in Nebraska has not yet learned that he can grow red clover here much more easily than he could on the old Eastern homestead. He has not yet learned that Nebraska soil will not "heave out" his choice stand of clover, as it did so often in the East. He has not yet learned that here the conditions which secure an abundance of perfect seed are most propitious. Yet all these things, and more too, are true. No other soil, no other climate, can produce better crops of red clover than the soil and climate of Nebraska. The exhibit of forage plants made by the western

counties at the late state fair, showed that red clover will grow, and grow well, in our westernmost counties. Specimens were shown from Dundy and Cheyenne counties, the first in the extreme south-western corner of the state, and the other on the western boundary, north of Eastern Colorado. That red clover will grow in any part of Nebraska has now been shown by actual trial, and no farmer need henceforth have any hesitancy in sowing it upon his farm.

(b) *What is the future of the native forage plants of the plains?*—The native grasses of the plains include some species which have been of much value to the grower of stock, and many a stock raiser in the state is ready to-day to say that he prefers these wild grasses for pasturage to any of the cultivated ones which may be brought in from other regions. So highly are the native prairie grasses valued by many that it is well for us to inquire as to what their future will probably be, in so far as their continued use for pasturage and hay is concerned.

Buffalo Grass.—Several entirely distinct species are popularly called by this name. All are, however, short grasses, unfit for making into hay, and although apparently quite nutritious, they supply so small an amount of food per acre that as the land becomes more valuable the farmer cannot afford to retain them. But even should he wish to retain them, he cannot; for they are unfitted to battle successfully with blue grass and white clover, with the blue stems and rank weeds which always spring into prominence upon the prairies when the settler stops the annual prairie fires. Moreover, they cannot endure the close cropping and tramping to which they are subjected when the land is enclosed and used for regular farming purposes. Already the genuine Buffalo grass (*Buchloe dactyloides*) has practically disappeared from the eastern third of the state. Of course I know very well that there are patches of it here and there in these older counties; it may be found in such patches within a mile or two of the capitol building; but these little patches are as nothing when compared with its former extensive distribution. A second grass commonly known by the name of Buffalo grass (*Bouteloua oligostachya*) is fast following the first. It is of a slightly taller growth, but under no circumstances can it be regarded as a desirable hay grass, although





PLATE VI.—BUSHY BLUE STEM (*Chrysopogon nutans*).

small lots of hay made from it in Eastern Colorado were shown at the last state fair. We need not mourn its early and inevitable disappearance.

Blue Stem (species of *Andropogon* and *Chrysopogon*).—Several species of grasses are included under the name of blue stem. It is needless here to attempt to separate them, or to give them a technical description. Let it suffice to say that they are coarse, tall grasses, not very distantly related to the sugar canes. They contain a good deal of sugary matter, and hence are quite palatable to domestic animals. Being of rank growth, often attaining a height of from four to six feet, they produce a large amount of forage per acre. By many farmers the blue stems are considered to be among the best of hay-producing grasses, and many feeders prefer the hay made from them to that made from even the cultivated forage plants. So far, however, as the amount of nutriment is concerned, these grasses are by no means equal to even the poorest of the old grasses and clovers, and were they to be judged by this standard alone they could not for a moment hold their place among the valuable forage plants. But it must be borne in mind that it is not always the plant that is intrinsically the most valuable that in practice is the most desirable. In this Western country, where corn and other grains are so cheap, it is often desirable to add to the ration of our animals a coarse food, and here a less nutritious but bulky material is actually preferable to the more compact and nutritious one.

Will the blue stems be given a place upon the farms of the future? is a question which is often asked. It is always unsafe for one to attempt prophecy, and I will not venture to do so now. To me it seems doubtful whether blue stems can long maintain a place among forage plants. If it should be agreed that it is desirable to retain them, the question of their ready propagation upon the farm is as yet an unsettled one. Upon this latter point I invite suggestions and such information as you may be able to give. I hope to see at an early day some careful experiments made to determine this, so far as it is possible to do so upon our Experiment Station.

Other Wild Grasses (species of *Bouteloua*, *Koeleria*, et al.) There are many grasses which now furnish a good deal of pasturage, and

not a little hay, but with one or two exceptions it is doubtful whether it will pay to attempt to retain them. That they have some value cannot be doubted; but whether that value is sufficient to induce farmers to make an effort to bring them under cultivation is quite improbable.

A species of Muhlenberg grass (*Muhlenbergia glomerata*) has been shown to be more nutritious than any of our cultivated grasses, and yet in spite of the fact that it is common, and apparently easily propagated, scarcely anything has been done to bring it under cultivation. The experiment must be made by some state experiment station, if it is ever made at all.

(c) *New Grasses and Forage Plants for the High Plains.*—I mention this topic here in order to briefly call attention to a work which has lately been undertaken by Dr. Vasey, the well-known botanist of the Department of Agriculture at Washington. In pursuance of the liberal and intelligent policy of the present Commissioner of Agriculture, Dr. Vasey spent some time upon the high plains of Western Nebraska and Kansas and Eastern Colorado, studying the native grasses and forage plants with special reference to the discovery of some new grasses which might be brought under cultivation in those regions. No definite results have yet been reached, but if the proper support can be secured, a series of experiments will be instituted at Fort Wallace, and certain of the more promising wild grasses of the far West will be put upon trial. This work is of so much interest to us that we may well give it our heartiest support.

(d) *Forage Plants under Irrigation.*—Here again I will but briefly call your attention to a topic of interest, so far as our far western counties are concerned. While I can speak from general observations only, not having exact data at my command, I venture the assertion that ultimately a considerable portion of the area of cultivated soil in our western counties will be provided with facilities for irrigation. The rapid descent of the rivers, as they run down the great slope, is such that the construction of irrigating canals is rendered comparatively easy. Should this be accomplished, it would render possible the growth of forage crops such as we have never so much as dreamed of for amount. Red clover, alfalfa, timothy, and blue grass and many others, now grown on the irrigated lands of Colorado, might



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PLATE VII.—BUFFALO GRASS (*Buchloe dactyloides*).

then be grown in enormous quantities, two or three crops a year growing upon each field with but little trouble. For the successful prosecution of this work of the future we need to jealously guard the great mountain forests in Colorado and Wyoming, from which our rivers derive their supply of water. These Nebraska rivers are fed upon the snows which annually fall in heavy masses upon the Rocky mountains. If these mountains are covered with forests, the snows melt slowly, and so gradually give out their precious waters to the streams as they flow over the great plains, giving to the soil a fertility like that of ancient Egypt. But if we allow the forests of the mountains to disappear, the snows will quickly melt before the early summer's suns, and by midsummer there will be only the sandy beds of the former great rivers of the plain.

Gentlemen of this society, we cannot afford to sit still while this destruction of our wealth-giving rivers is going on. Every year thousands of acres of the mountain forests of Colorado and Wyoming are destroyed, and year by year our midsummer rivers are dwindling away. We owe it to ourselves, to our children, to our good state, to see that this heritage is not taken from us.

II.—REPORT OF WORK DONE.

Since my appointment as botanist to the society the following work has been done upon the general problem assigned to me by you, viz., the investigation of the forage plants of the state.

1. *The collection of authentic specimens for study and comparison.* In order that the work done shall be reliable, it is necessary that access shall be had to an abundance of specimens of the grasses and forage plants of America, as they are now known to science. Such a collection of material we were making in the herbarium of the University, and upon receiving your commission I began as soon as possible the labor of arranging it in convenient order for study and examination. There are now available for this purpose about six hundred specimens, representing no less than three hundred and seventy-one different species of the grasses alone, while for the other plants which are more or less used for forage there are probably fully as many more. The importance of such a standard collection for study

and comparison can not be overestimated, and it is my intention to continue the work of enlarging and perfecting it as rapidly as possible.

2. *The literature of the forage plants.*—Not only are standard collections of specimens necessary, but the careful student needs to have at hand for ready reference all the important literature of the subject. Much has been recorded in regard to the plants which here and there throughout the world have been used for forage, and these records must be consulted if our work is to be complete and reliable. There are now available for such study all the manuals which contain descriptions of North American grasses, together with a number of special works, the more important of which are the following, viz.:

Gray's Manual of the Botany of the Northern United States.

Coulter's Manual of the Botany of the Rocky Mountain Region.

Chapman's Flora of the Southern United States.

Watson's Botany of California.

Watson's Botany of the Fortieth Parallel. (Vol. V. of U. S. Geological Exploration.)

Rothrock's Botany of the Region west of the One Hundredth Meridian. (Vol. VI. of U. S. Geographical Surveys.)

Torrey's Reports on the Botany of the Pacific Railroad Route. (Various volumes of Pacific Railroad Reports.)

Vasey's Agricultural Grasses of the United States.

Vasey's Descriptive Catalogue of the Grasses of the United States.

Steudel's Synopsis Plantarum Graminarum.

Sowerby's Grasses of Great Britain.

Flint's Grasses and Forage Plants.

Beauvois' Agrostographie.

Kunth's Agrostographia.

Trinius' Species Graminum.

Trinius' Genera Graminum.

Trinius' De Graminibus.

Trinius' Clavis Agrostographiæ.

Trinius' Fundamenta Agrostographiæ.

Nees' Glumacæ Capensis.

Buchanan's Indigenous Grasses of New Zealand.

Jessen's Deutschlands Gräser.



PLATE VIII.—GRAMMA (*Bouteloua oligostachya*).

3. *Circular.* On the first of June I sent out about two hundred and fifty copies of a special circular, addressing it in many instances to an officer of the local agricultural society, in others to the county papers, with a request for notice or republication. In other cases it was sent to individuals who were known to have an interest in this department of agriculture. The following is the circular:

THE GRASSES AND FORAGE PLANTS OF NEBRASKA.

CIRCULAR NO. 1.

INDUSTRIAL COLLEGE OF THE UNIVERSITY OF NEBRASKA,
LINCOLN, June 1st, 1886.

At the request of the State Board of Agriculture I have undertaken to prepare a report on the grasses and forage plants of Nebraska, for publication in the annual volume. In order that it may be as complete as possible, I ask the aid of every one who is interested in the agricultural development of our state. At this time I wish particularly to direct attention to the following:

1. I desire samples of every grass which grows naturally (wild) or cultivated in any locality. They should be sent in flower or seed, and each sample should contain not less than half a dozen full plants, root and all. Tie a string around each sample, and attach a tag with the *number of the sample, and your address* upon it. Number your samples from one upward. Wrap the samples in a newspaper and send them to me by mail. Send one sample or any number in each package, as suits your convenience. If only the *sample number and your address* are written in the packages, the postage is one cent for each ounce.

2. As you send samples, send also a letter or postal card, giving your observations upon each grass, stating whether it has any value, whether it is eaten by stock, upon what soils and situations it grows, whether it is abundant, etc., etc.

3. State also what grass furnishes the *greater part* of the pasture in your neighborhood; what furnishes the *best* pasture in your neighborhood; what the *greater part* of the hay; what the *best* hay.

4. Similar samples and information are desired for the clovers and other forage plants.

Address

CHARLES E. BESSEY,
Lincoln, Neb.

 Postage paid on packages, etc., will be refunded.

To the circular just given I have received many valuable answers, and I have a mass of specimens from many parts of the state, which will prove of great use in determining the size, value, and general distribution of the species. Still the data are too meagre for us to base reliable conclusions upon, and the work of adding to them must be prosecuted for at least another year. In the meantime the material on hand is being arranged, and the facts tabulated for future reference.

4. *General Correspondence.* The general correspondence connected with the work has been considerable, and this has increased as it has become more widely known that such an investigation has been undertaken. Were there no other outcome from the work than the increased interest in and observation of our forage plants by the people of the state, the time and labor given would be amply repaid. The correspondence has also included frequent communication with recognized authorities upon the subject of the grasses, and I would here acknowledge my indebtedness to Dr. George Vasey and Mr. E. L. Scribner, of Washington, D. C., and to Dr. W. J. Beal, of Lansing, Michigan, for courtesies received at their hands.

III.—THE CONTINUATION OF THE WORK.

The year which I have now given to the work of preparing a report upon the grasses and forage plants of Nebraska has shown me that it will require a good deal of time to complete it satisfactorily, if we wish to give it permanent value. Many of my correspondents have expressed themselves as anxious to continue the work another year at least, and others who learned of the work too late in the season to be able to render any assistance have expressed their desire to do so the coming year. If you order the continuation of the work I shall send out another circular to my correspondents, and to the prominent stock-growers in various parts of the state, requesting answers to specific inquiries. For this purpose I shall be glad to have the privilege of expending about the same amount of money as during the past year. That such an expenditure will result in much good to the people of the state, I have not the slightest doubt. The forage problem is so important that it can well demand attention from every industrial organization in the state.

IV.—POPULAR DESCRIPTIONS OF SOME GRASSES.

In order to avoid confusion in the case of grasses which bear the same popular name, and to contribute to a more accurate knowledge of some of the wild species of the state, I append herewith ten plates, with plain descriptions.



PLATE IX.—MUHLENBERG'S GRASS (*Muhlenbergia glomerata*).

W.H. NICHOLS. EJ

A.—CULTIVATED GRASSES.

1. TIMOTHY. PLATE I. (*Phleum pratense*.)

Stem rather firm and somewhat harsh to the touch, from two to three feet high; leaves flat, one-fourth inch wide, six to eight inches long, light green in color, slightly harsh to the touch; head cylindrical, compact, roughish, one-fourth to one-third inch thick, and from two to six inches long. The stem usually has a bulbous enlargement at the lower end, and from the base of this the fibrous roots grow out.

2. KENTUCKY BLUE GRASS.—PLATE II. (*Poa pratensis*.)

Stem slender, smooth, from one to two feet high when in bloom or seed; leaves channeled on the upper surface, one-eighth inch wide, six to twelve inches long, dark green in color, smooth to the touch; head bushy or branching, very variable in size, from one to four inches wide, and one to six inches long, each hair-like branch ending in a flattish, oval flower cluster, when well-grown one-eighth wide by one-fourth inch long, often much smaller on poor specimens. The roots are fibrous, and there are in addition numerous underground scaly root-stocks, which creep through the soil and rapidly spread the plant.

3. ORCHARD GRASS.—PLATE III. (*Dactylis glomerata*.)

Stem rather firm and somewhat harsh to the touch, from two to three feet high; leaves flat, one-fourth to one-third of an inch wide, six to eight inches long, light green in color, slightly harsh to the touch; head somewhat spreading, composed of from eight to a dozen or more masses of rather rough, coarse, chaffy flower clusters; each mass of flower clusters is irregularly rounded or oval, and is borne upon slender, thread-like stalks. The roots are fibrous, and produce their stems in bunches.

B.—BLUE STEM GRASSES.

4. LITTLE BLUE STEM.—PLATE IV. (*Andropogon scoparius*.)

Stem slender, smooth, shining, more or less reddish, with dark joints, one and one-half to two feet high; leaves channeled on the upper surface, narrow, one-fourth of an inch wide or less, six to ten inches long, light green, with a tendency to a reddish tinge, nearly smooth; head composed of a few erect branches, each bearing a loose

silky spike; each flower bears a delicate awn (beard). The stems grow in bunches and are slightly swollen at the base; roots fibrous.

5. BIG BLUE STEM.—PLATE V. (*Andropogon provincialis*.)

Stem stout, smooth, and shining, more or less purplish, with bluish or purplish joints, three to six feet high; leaves flat, one-fourth to one-third of an inch wide, eight to twelve inches long, light green, roughish to the touch; head composed of numerous erect branches, each bearing two, three, or, rarely, four, rather dense spikes, which are scarcely silky; flowers purplish, and bearing a very slender awn (beard). The roots are fibrous, and the stems grow in bunches.

6. BUSHY BLUE STEM.—PLATE VI. (*Chrysopogon nutans*.)

Stem stout, smooth, and shining, green, with joints slightly bluish or purplish; three to five feet high; leaves flat, one-fourth inch wide, six to ten inches long, light green, nearly smooth to the touch; head bushy or branching, six to eight inches long, composed of numerous brown silky flowers, each bearing a delicate awn (beard); root fibrous, bearing several stems. This grass is not so much inclined to grow in bunches as are the two preceding species.

C.—BUFFALO GRASSES.

7. BUFFALO GRASS (proper).—PLATE VII. (*Buchloe dactyloides*.)

Stem slender, smooth, shining, three to eight inches high; leaves very narrow (one-sixteenth inch or less), two to five inches long, light green, nearly smooth; heads of two kinds, generally on different plants—male heads, usually two, standing obliquely near the top of the stalk, one-third to one-half of an inch long, green, and smooth to the touch; female head, a rounded cluster of a few hard chaffed, prickly flowers, which are much overtopped by the surrounding leaves. Roots fibrous, bearing a bunch of stems. Just at the surface of the ground the plant sends out running stems, which creep over the surface and readily take root, thus enabling it to spread with rapidity.

8. GRAMMA.—PLATE VIII. (*Bouteloua oligostachya*.)

Stem slender, smooth, shining, eight to twelve inches high; leaves very narrow (one-sixteenth of an inch), two to four inches long, light green, smooth; heads, usually two, standing obliquely near the top of



CH. HEIDEMANN.
 PLATE X.—MOUNTAIN BLUE GRASS (*Poa andina*).

the stalk, one to one and one-fourth inches long, dark purplish, rough, hairy, and bristly; root fibrous.

D.—NEW GRASSES.

9. MUHLENBERG'S GRASS.—PLATE IX. (*Muhlenbergia glomerata*.)

Stem rather slender, smooth, shining, two to three feet high, and repeatedly branched; leaves flat, numerous, three-sixteenths inch wide, light green, roughish; head cylindrical, one-third inch thick and two to three inches long, frequently inclined to branch, green, smooth to the touch, each flower tipped with an awn (beard); roots fibrous, sending up few stems, but near the surface of the ground numerous creeping, scaly root-stocks run out into the soil and rapidly spread the plant.

10. MOUNTAIN BLUE GRASS.—PLATE X. (*Poa andina*.)

Stem slender, flattish, smooth, about one foot high; leaves channeled on the upper surface, narrow (one-sixteenth inch), three to four inches long, of rather firm texture, smooth; head slightly spreading, one-half to one inch wide and one to two inches long, each short, hair-like branch ending in a flattish, oval flower cluster one-sixteenth to one-eighth of an inch wide and one-eighth to one-quarter of an inch long; roots numerous, fibrous, bearing numerous stems. The whole appearance of the plant is much like that of small specimens of Kentucky Blue Grass.

CORN: ITS ORIGIN, HISTORY, USES, AND ABUSES.

BY ROBERT W. FURNAS.*

INTRODUCTION.

I enjoyed the distinguished honor of representing the young agri-

*In the preparation of this paper I am indebted for valuable data to the American Antiquarian Library, Illinois State Agricultural Library, Prof. Johnson's "Agricultural Chemistry," Prof. Lazenby, Ohio Agricultural Experimental Station, Geo. Noyes, of the *Massachusetts Ploughman*, and Orange Judd, *Prairie Farmer*. I have not quoted literally, but for condensation and brevity, in substance using principally my own phraseology and diction.

cultural giant, Nebraska, at the "World's Industrial and Cotton Centennial Exposition," New Orleans, La., 1884-5. When I accepted the position tendered me by the president of the United States, as commissioner, I determined to make a point on the great staple product of Nebraska, corn. The first banner I flung to the breeze in government building had inscribed on its folds, "Corn is King." To go South and claim king for any other soil product than cotton, especially at the "Cotton Centennial," was deemed an intolerable bit of impudence, in nowise orthodox—a broad-gauge departure. Cotton, sugar, and tobacco all elevated their nasal protuberances, saying by actions, which are said to "speak louder than words," "*How dare you!*" Minnesota, "the state with boundless wheat fields glinted," our next-door neighbor at the exposition, was "to arms" "in the twinkling of an eye," pressing the superiority of wheat and invoking the muses to aid her in obliterating our banner inscription. Colorado, Kansas, Illinois, and Dakota set themselves to work manufacturing huge artificial ears to eclipse our natural growth of "Chester County Mammoth." For a time outsiders entertained doubts as to our ability to maintain the advanced position taken. But we "fought it out on that line," and came home "with our banner still there."

And now, in calmer moments, as it were, I am bold to assert the belief that among all the factors of culture in the United States, corn takes precedence in the scale of crops, as best adapted to more soils, climates, and conditions; is used for more purposes; furnishes more nutritive food for man and beast; has more commercial, cultural, and economic value; gives more grain to the acre than any other cereal; more fodder than any other of the grasses; puts our beef in prime order; fattens our pork; is the basis of our butter and cheese supply; furnishes immense manufacturing material; has twice the value of cotton; worth fifty per cent more than wheat; its influence on the prosperity and wealth of the United States is greater than that of any other cultivated plant; and to the transportation companies has "millions in it." The belief has been expressed that had not the Pilgrim Fathers discovered this golden grain the first winter they landed on our shores, this "land of the free and home of the brave"

would to-day be an "unsolved problem." But why extend? Its uses and values are endless and incalculable.

In round numbers, the corn crop of the United States for 1885 is put down at two billions of bushels, a gain of near ten per cent on 1884. In the corn acreage of the entire country there was a gain of six per cent. In the twelve leading corn states, seven per cent; four per cent in the South, and one per cent in the New England states. A statistical calculator estimates that were all the corn crop of 1885 put in flour barrels and stood as closely together as possible, they would stretch sixty times across this continent.

The last National Census Report shows these figures:

	ACRES.	BUSHEL.
Wheat	62,368,869	459,479,535
Oats.....	16,144,593	407,858,999
Barley	1,997,717	44,113,495
Rye	1,842,303	19,831,595
Buckwheat.....	848,389	11,817,727
Total	83,201,871	943,101,351
CORN.....	62,368,869	1,754,861,535
Excess over all other grains.....		811,760,184

That is to say, the bushels of corn grown equaled all other grains, and a *surplus of over 86 per cent*. Take the crops when other grain yields were unusually large, viz., in 1884:

	ACRES.	BUSHEL.	VALUE.
Wheat.....	39,475,885	512,765,000	\$330,862,260
Oats.....	21,300,917	583,628,000	161,528,470
Barley.....	2,603,318	61,203,000	29,777,170
Rye.....	2,343,963	28,640,000	14,857,040
Total	65,729,583	1,186,236,000	\$537,024,940
CORN	69,683,780	1,795,528,000	640,735,560
Corn excess.....	5,954,197	609,292,000	\$103,710,620

One hundred and three million dollars more in value of corn than all other grains!

ORIGIN.

This wonderful product, which has conferred more substantial ben-

efits on the world, as well as indirectly inflicting more ills on the human race than any or all others known to civilization, strange to say, is of unknown origin—wrapped in mystery, or at least is not definitely fixed. A learned author, after much thought and investigation, concludes with the expression: "Like that of wheat and barley, its origin is lost in the twilight of antiquity."

Scientifically speaking, it belongs to the natural order of *Gramineæ*, and is a *monœcious* grass. Linnæus adopted as the specific name of his genus *zea*, "to live," "affording substance to animals." Its botanical nomenclature is *zea mays*—*maize*, more simplified, Indian corn; in common parlance, plain corn.

It was first cultivated in the United States by the English, on James river, Virginia, in 1608, the seed of which was obtained from the Indians, who claimed to be the originators, or first discoverers of the plant—receiving it direct from the hands of the Creator. Schoolcraft gives their mythological history of it: "A young man went out into the woods to fast, at that period of life when youth is exchanged for manhood. He built a lodge of boughs in a secluded place, and painted his face of a sombre hue. By day he amused himself in walking about, looking at the various shrubs and wild plants, and at night lay down in his bower, which being open, he could look up into the sky. He sought a gift from the Master of life, and he hoped it would be something to benefit his race. On the third day he became too weak to leave the lodge, and as he lay gazing upward he saw a spirit coming down in the shape of a beautiful young man, dressed in green and having green plumes on his head, who told him to arise and wrestle with him, as this was the only way in which he could obtain his wishes. He did so, and found his strength renewed by the effort. This visit and the trial of wrestling were repeated for four days, the youth feeling at each trial that, although his bodily strength declined, a moral and supernatural energy was imparted, which promised him the final victory. On the third day his celestial visitor spoke to him. 'To-morrow,' said he, 'will be the seventh day of your fast, and the last time I shall wrestle with you. You will triumph over me and gain your wishes. As soon as you have thrown me down, strip off my clothes and bury me on the spot in soft, fresh

earth. When you have done this, leave me, but come occasionally to visit the place, to keep the weeds from growing. Once or twice cover me with fresh earth.' He then departed, but returned the next day, and, as he had predicted, was thrown down. The young man punctually obeyed his instructions in every particular, and soon had the pleasure of seeing the green plumes of his sky visitor shooting up through the ground. He carefully weeded the earth and kept it fresh and soft, and in due time was gratified by beholding the matured plant, bending with its golden fruit, and gracefully waving its green leaves and yellow tassels in the wind. He then invited his parents to the spot to behold the new plant. 'It is Mondamin,' replied his father; 'it is the Spirit's grain.' They immediately prepared a feast and invited their friends to partake of it, and this is the origin of Indian corn."

In 1621 the Indian chiefs Samoset and Squauto visited the Pilgrims at Plymouth, and instructed them how corn should be planted and the manner in which the ground should be prepared and manured with alewives—fish. The same year Edward Winslow and Stephen Hopkins visited the Indians at Namasket and Middleborough, who received them with great joy, and regaled them with bread called *mazium*, made from Indian corn.

Rifaud claims to have found "corn" under the head of a mummy at Thebes. If it was known to the Egyptians in Pharaoh's time, it was introduced into Palestine at a very early day. The word "corn," however, in biblical parlance, is known to signify all cereals. The Hebrew word *dagari* means to "increase," and can properly be rendered "grain," "corn," "wheat." In fact, the term "corn," as anciently used, is sufficiently comprehensive to include, not only all proper cereals, but various kinds of seeds and plants, in nowise belonging to grain products, says a learned writer upon this subject.

De Candolle and other ancient botanists assign the origin of this valuable grain to South America. Bonofous was of the opinion corn was indigenous, both in China and south-west South America. This theory was in accordance with an old idea entertained respecting many other tropical American vegetables. Humboldt maintains that corn is an American plant, and that the new world gave it to the old.

Those of his opinion claim that Columbus, on his return from his first voyage, in 1493, took to Europe the first grains of Indian corn, and thence its cultivation spread into Portugal and Southern Europe. The Portuguese, who were at that time the great navigators of the world, having doubled Cape Horn previously and discovered Java, in 1495 introduced it along the African coast and into Java, and thence its cultivation spread into India and China, and was correctly figured in a Chinese work on agriculture as early as 1552.

Another proof of American origin is the fact that in several forms it is found growing wild, from the Rocky mountains in North America to the humid forests of Paraguay. In southern sugar-growing regions "wild corn," as it is called, as a weed pest is equal to sand or cockle burr, Spanish needle, or smartweed in the North.

Corn did not grow in that part of Asia watered by the Indus at the time of Alexander the Great's expedition, as it is not among the productions of that country mentioned by Nearchus, the commander of the fleet. Neither is it noticed by Arrian, Diodorus, Columella, or any other ancient author. As late as 1491, the year before Columbus discovered America, Joan di Cuba, in his "*Ortus Sanitatus*," makes no mention of it. There is no satisfactory evidence that it has ever been found in any ancient tumulus, sarcophagus, or pyramid. Nor has it ever been represented in any ancient painting, sculpture, or work of art, except in America. According to Garcilaso de la Vega, one of the earliest Peruvian historians, the palace gardens of the Incas were ornamented with maize in gold and silver, with all the grains, spike, stalks, and leaves. In one instance, in the "*Garden of Gold and Silver*," there was an entire corn field, of considerable size, representing the maize in its exact and natural shape, a proof no less of the wealth of the Incas, than their veneration for this important grain.

The arguments derived from vegetable physiology strongly favor its Eastern origin. Because, while further India and China contain many native plants of related genera, like sorghum and millet, very little, if anything, of the kind is to be found among the botanical productions of South America. By the barest possibility, Indian corn may have been introduced into some portions of North America

by the Chinese centuries ago, and the present remote probability may become a reasonable one, if modern antiquarians succeed in establishing the fact of the discovery of America by the Chinese at least a thousand years before its discovery by Columbus—a triumph of skillful and successful research which may not be far off.

Whatever the origin of corn may have been, whether with the Indians of North America, or “on the slopes of the Andes, or in the fertile valleys of the mountains of China,” modern botanists and naturalists are agreed that the origin was of the species *zea tunicata*—clothed corn; that is, each kernel was enveloped in a separate tunic, or husk, similar to grains of wheat in the head. Descending from this type, species, classes, and varieties have become almost innumerable, each country, climate, soil, situation, and parallel having those suited to the circumstances. No plant accepts the modifications of soil, climate, and conditions so readily and quickly as corn. No other succeeds so well from the equator to, say 50° north and south latitude. None so easily preserved through all seasons, and for such length of time. It is called both the “poor man’s crop” and “the lazy man’s crop,” because, particularly, it can be left standing in the field almost from one year’s end to another, not requiring to be garnered at any specific period. This mode of caring for a corn crop, however, is not presented in form of a recommendation by any means, but simply as showing a characteristic. In any event, it is the crop for the million.

RACES AND VALUE.

There are at least five distinct races or species of corn—Dent, flint, sweet, pop, and soft. These divisions are plainly marked, and easily distinguished by inspection of either, or both, ears and kernels. The number of what may be properly termed varieties are unlimited almost, the names principally local, few only having become of general use. White Dent, yellow Dent, Yankee flint, calico, bloody butcher, late sugar, early sugar, red pop, white pop, squaw, Chester county, or Pennsylvania mammoth, and others that might be named, are known in almost all sections. In the collection I had on exhibition at New Orleans there were seventy-five distinct varieties grown in Nebraska. There are different types of growth under each of the principal divi-

sions named, showing distinct characteristics, and which invariably produce ears true to their type, when kept free from others, such as pure white, pure yellow, pure red, regular mixtures, eight-rowed, and other numbered rows. The Indians have, by close attention, a marked corn, of precise and exact mixtures of different colored grains on the same ear, each band having its peculiar mixture. For instance, one band has all red and white grains, another all black and yellow grains, another all pure white, another all pure black, and so on, with various distinctions, said to have originated as a means of detecting theft by one band from another. All may be simplified under these heads, viz., Dent, flint, etc., races; yellow, white, etc., classes; and large, medium, and small types.

After all, nomenclature is of secondary importance when compared with a standard of excellence. The first prime point in an ear of corn is its nutritive substance. It should show a proper proportion of *protein*, *carbo-hydrates*, and *fat*. It is generally considered that the flint and sugar varieties show a higher nutritive ratio than the Dents. The latter, however, are in more general use commercially, and therefore regarded as the standards. The average of a given number of analyses of the Dent varieties show:

	WATER	ASH	ALBU- MINOIDS	FIBRE	CARBO- HY- DRATES	FATS
Average.....	11.25	1.48	10.49	1.91	70.15	4.71
Maximum	15.24	1.79	11.75	2.95	75.26	6.28
Minimum	6.22	1.28	8.105	1.25	66.26	3.80

These analyses fairly represent the composition of Dent corn. A more evenly balanced ratio of this great stock food would be desirable. A maximum of *albuminoids* should be maintained, even at sacrifice of *carbo-hydrates*. Kernels which contain the greatest amount of *corneous* matter are considered richest in *albuminoids*, say chemists. The matter of first importance is, that the per cent yield of kernel be as large as possible without injuriously weakening the cob, which sustains and through which it directly receives its nourishment.

The "Ohio Experiment Station" has established a scale of points of excellence of what Prof. Lazenby is pleased to term an ideal ear of corn, as follows:

<i>Points.</i>	<i>Value of Each.</i>
Greatest per cent of shelled corn.....	40
Trueness of type.....	10
Evenness of diameter.....	10
Length of ear.....	10
Number of rows.....	5
Size and shape of kernel.....	10
Hardness of kernel.....	15
Total	100

It will be seen the prominent points in the scale are yield and hardness of kernel. Hard kernels, as in the flints, are believed to contain a larger per cent of *protein*, an important desideratum.

SEASON.

The corn season—that is, the time required to mature, is not of as much importance with us in Nebraska as in other sections. We are in the corn belt proper, and almost any of the valuable races or varieties will ripen without risk. One hundred and ten days from date of vegetation to date of ripening or security from frost is about the average season in the corn belt. Here we are quite sure of at least one hundred and twenty days, say from first to fifteenth of May, our corn planting season, usually to first to fifteenth of September, the ordinary period of security. While the dates given are those observed by thrifty, intelligent farmers, as a rule, there is much variance in time of planting. Some are slow naturally, and others, at times governed by uncontrollable circumstances, do not get corn in the ground until the middle of June, and yet, more frequently than otherwise, escape early frosts. It will be remembered by those who were residents of this state when we were overrun with spring grasshoppers, that no corn stand was obtained before the twentieth of June planting. Planting was continued until along as late as the fourth of July. Near all the June planting matured well, and that in July made excellent soft

corn for stock feeding. It was remarked that stock never did so well as the winter following, thus showing that corn can be depended upon with a favorable ninety day season. I speak of the Dent varieties, because, as said, they are our standards.

The fewer-rowed varieties generally have longer ears, yield less per acre, have over an average cob weight, and mature somewhat earlier. The many-rowed varieties have shorter ears, increased kernel yield and weight, and decrease in weight of cob, and ripen a few days only later. The standard legal weight for cobs per bushel of shelled corn is fixed at fourteen pounds. Standard varieties in Nebraska seldom exceed twelve pounds of cob, and run as low as ten and nine.

There is difference of opinion as to the number of rows a standard or ideal ear of corn should contain. Sixteen may be called a safe compromise. The size and shape of an ideal kernel is of importance. It should be of good depth, wedge shape, filling up the ear compact, with a smooth, square surface, well glazed, well filled at the end, simply a round dimple or slight depression. Too much wrinkling at the end indicates a lack of *corneous* matter.

SEED AND YIELD.

In my humble opinion, farmers as a rule do not attach sufficient importance to corn yield. When our average yield the state over is put down at forty bushels to the acre, we are apt to say, "that is good." But the careful, intelligent corn-grower should not be content with a less average yield than seventy-five bushels to the acre. Exercising care in matters of seed, adaptation of soil, tillage, and garnering, there is no good reason why this yield should not be had. Our state board of agriculture has awarded premiums on as high as one hundred and fourteen bushels per acre. "Less acres and more bushels," is a good agricultural motto. "A maximum yield with a minimum of human toil" and we "become lenders and no longer borrowers."

I speak of care in selecting seed. Orange Judd, in his admirable paper before our state fair last fall, treated this subject forcibly and in detail, showing that fully one-tenth of our whole corn crop is lost annually by the use of bad seed—failure to select and preserve good seed. I am informed by grain dealers that it is very rare that Ne-

braska or any Western corn goes into the market as grade No. 1, There is a reason somewhere for this, as well as a remedy. The season, climate, and soil in Nebraska will produce No. 1 corn if the conditions are made equal. No. 1 seed of a No. 1 type, with No. 1 care and attention, will produce No. 1 corn.

The most successful corn farmers are those who, as it were, have made their own varieties. First select of the corn in their own locality the best obtainable type. From this choose annually the best seed ears, until it is bred to a desirable or required standard. It has been demonstrated that too frequent exchange of seed corn over any wide extended region usually works harm. The idea that there must be a mixture of types planted together to secure crosses as a means of improvement is erroneous, for out of the chaos of types resultant from any cross, a pure type must again be selected before you are on the road to success. "Selecting from existing types, and keeping the types pure," should be the watchword of the farmer who aspires to highest success.

[After the delivery of this paper at Seward, J. H. Purdum, one of the most successful corn-growers of that county, informed me that four of the principal corn premiums awarded at that fair were from a line of seed he had followed for thirty years in the states of Illinois and Nebraska.]

We are prone to talk of the old, worn-out soil in the East sometimes derisively. True, that comparatively a few years since the corn grown on the exhausted soils of New York and New England was yielding five to ten bushels to the acre, and those farming seemed content with that. The same soil, well manured, now brings fifty and seventy-five bushels per acre. The farmers of those regions are claiming that corn is now their most profitable crop. I have the authority of T. S. Gold, Secretary of the Connecticut Agricultural Society, that one T. B. Wakeman, of that state, has secured the enormous yield of one hundred and seventy-nine bushels and twenty-three quarts shelled corn from an acre of ground. This, of course, is an exceptional yield, but shows the possibilities of the crop under scientific management, and should teach us in the West, with the rich, fertile soil we are heir to, not to be plodding along with a forty bushel yield.

TIME AND MANNER OF PLANTING.

Time of planting, depth, and number of kernels to the hill are all subjects of much discussion and speculation. As to time of planting, there is no little force in the reply said to have been given by the late Horace Greeley to an inquiry said to have been made him. When asked, "When is the best time to set a hen?" The reply was: "When the hen is ready." The best and proper time to plant corn or any other seed is when the soil is ready. That is, when sufficiently warm and otherwise in condition to at once embrace the seed entrusted to its care, hasten to vegetation, and forward as rapidly as possible to completion of cycle. With us, this condition seldom occurs before the date I have indicated for planting—first to tenth of May—often the latter part. When planted before the soil possesses the essential warming influences, much of the seed rots outright or becomes enfeebled, and a poor or delicate stand is the result. I have in my mind's eye two adjoining fields planted in corn the same year. One the latter part of April and the other late in May. The May planting by far, in all respects, excelled the April planting. It came up quick and went along rapidly without hindrance. The April planting never got out of a stunted strata.

There are advocates of both deep and shallow planting, each claiming superior success. My thirty years' experience and observation of the soil and climate of this state, warrants the belief that the sooner corn can be gotten above the surface the better. In other words, plant shallow, get the corn up, and give roots depth with after culture. It is important, under our hot suns, that roots be well down in the soil, with a downward tendency, at least until the top has sufficiently advanced to shade the roots. While it is true the atmospheric conditions are not the same on similar dates for different years, the effect on plant growth is as important as though the seasons obeyed fixed laws. I repeat, the sooner both the functions of root and leaf are brought into joint exercise and duty, the better.

Another somewhat vexed problem, but which I think practical experience has solved, is, how close shall corn be planted to secure best results in the matter of yield? The old rule when I was a boy on the farm—corn was planted four feet by four, marked off by an old-

fashioned bull tongue plow, dropped by hand, four to six kernels in a hill, and covered with a garden hoe. Now, with the modern improved planters, rows three and a half feet apart, kernels can be put in any distance apart and as many in a hill as desirable. It has been demonstrated that a stalk of corn requires about fifteen inches by three and a half feet. The highest yield has been produced with rows three and a half feet, two kernels in a hill, fifteen inches apart. The next best yield, one kernel in a hill nine inches apart, and the next, two kernels in a hill twenty-four inches apart, rows all the same distance—three and a half feet. The highest ear development was produced from the single grain hill nine inches apart.

MILK AND BUTTER FACTOR.

Believing that the time is in the very near future when dairy products will become a prime factor among our valued industries, I present the following regarding corn as a milk and butter producing factor.

I quote in substance from a series of experiments made by Prof. Henry, of the Wisconsin Agricultural Experimental Station. These experiments were made to ascertain: *First*, The relative values of corn fodder and mixed hay for producing milk and butter. *Second*, The relative values of corn fodder and clover hay for producing milk and butter. *Third*, The amount of milk and butter an acre of corn will make when fed to milch cows. *Fourth*, The value of an acre of corn when turned into milk and butter.

Four excellent butter cows were selected and divided into lots of two each, of equal capacity for producing milk and butter, as near as could be judged. In the first trial, the ration of lot one was five pounds of corn meal and seven pounds of bran per cow daily, in two feeds, fed dry, and as many corn-stalks as they would strip. The ration for lot two was the same as that of lot one, except for the corn-stalks mixed hay was substituted. After feeding carefully for a week, the ration was continued and the milk and butter product saved for fourteen days. At the end of this period the hay and corn-stalks of the two rations were changed about for the two lots, and the trial repeated.

Six weeks were required to complete the test with mixed hay and corn-stalks, and, this done, the whole trial was repeated, except that clover hay was substituted for the mixed hay, the corn-stalk ration being continued.

Comparing corn-stalks with the mixed hay, when supplemented by 280 pounds of corn meal and 392 pounds of bran, we find 2,374 pounds of corn-stalks yield 1,120 pounds 12 ounces of milk, making 57 pounds $\frac{1}{2}$ ounce of butter; 755 pounds of mixed hay yield 1,063 pounds 15 ounces of milk, making 56 pounds $1\frac{1}{2}$ ounces of butter; or 56 pounds 13 ounces of milk, and 15 ounces of butter more from the stalks than from the mixed hay.

Comparing corn-stalks with clover hay, as in the previous instance, we find 1,867 pounds of corn-stalks yield 1,079 pounds 3 ounces of milk, making 52 pounds $2\frac{1}{2}$ ounces of butter; 6,421 $\frac{1}{2}$ pounds of clover hay yield 1,059 pounds 1 ounce of milk, making 54 pounds $8\frac{1}{2}$ ounces of butter; or 20 pounds 2 ounces more milk and 2 pounds 6 ounces more butter from the corn-stalks than from the clover hay.

Taking into consideration the fact that the milk and butter yield are both larger from stalks than from the mixed hay, it is fair to say that the corn-stalks were worth one-third as much as the mixed hay—that is, one ton of mixed hay is worth three tons of stalks fed as these were.

From the second trial we see that one ton of clover hay was worth somewhat more than three tons of corn-stalks fed as described.

In the two trials 4,241 pounds of stalks were fed, and 1,450 pounds weighed back as coarse parts that the cows refused to eat. This is over 34 per cent of the whole amount of the stalks, by weight, lost by feeding in this manner.

Arranging figures in another form, we have the following: Food required for 100 pounds of milk when feeding corn-stalks—193 pounds of corn-stalks, 25 pounds of corn meal, 35 pounds of wheat bran. Food required for 100 pounds of butter when feeding corn-stalks—3,880 pounds of corn-stalks, 514 pounds of corn meal, 719 pounds of wheat bran. Food required for 100 pounds of milk when feeding mixed hay—71 pounds of mixed hay, 26 pounds of corn meal, 36 pounds of wheat bran. Food required for 100 pounds of

butter when feeding mixed hay—1,348 pounds of mixed hay, 500 pounds of corn meal, 700 pounds of wheat bran. Food required for 100 pounds of milk when feeding clover hay—60 pounds of clover hay, 26 pounds of corn meal, 37 pounds of wheat bran. Food required for 100 pounds of butter when feeding clover hay—1,179 pounds of clover hay, 513 pounds of corn meal, 718 pounds of wheat bran.

From the data here given one can easily calculate the cost of food necessary to produce 100 pounds of milk or butter. Supposing hay is worth \$8 per ton, then the corn-stalks would be worth \$2.66, or one-third the value of the hay, as shown by these experiments. Suppose further that bran can be had for \$12 and corn meal for \$15 per ton—assuming these prices, we will find that the food necessary to produce 100 pounds of milk costs, as the average of the before detailed experiments, about sixty-six cents, and the food to produce 100 pounds of butter costs about \$12.84. •

With these facts and those of experiments before us, let us attempt to estimate the butter that can be produced from an acre of corn land.

For this purpose let us assume that 4,491 pounds of ears from an acre would make 4,000 pounds of corn meal, allowing for shrinkage and grinding about twenty per cent, which is fully enough for corn as dry as this at husking.

Now most farmers would be unwilling to trade a ton of corn meal for a ton of bran, but let us substitute bran for corn meal, pound for pound in part, so as to have seven pounds of bran for each five of corn meal. The two tons of corn meal then would give us 2,334 pounds of bran and 1,666 pounds of corn meal.

By our experiments we have shown that, by feeding as described, 193 pounds of corn-stalks made 100 pounds of milk, and for 100 pounds of butter 3,874 pounds were required; also, that 25 pounds of corn meal and 35 of bran were required, in addition to the corn-stalks, for 100 pounds of milk, and 514 pounds of meal and 718 pounds of bran for 100 pounds of butter.

From this we see that an acre of land produced sufficient grain food for 6,664 pounds of milk, or 324 pounds of butter, and sufficient corn-stalks for 2,324 pounds of milk, or 115 pounds of butter.

Valuing milk at \$1.00 per 100 pounds and butter at 20 cents per pound, we find that one acre of land produced sufficient corn-stalks for \$23.24 worth of milk, or \$23.00 worth of butter, and meal sufficient for \$66.64 worth of milk, or \$64.88 worth of butter.

ABUSES.

It is said, and truly, that none of us are without a fault of some kind. The good book says, "There is none good; no, not one." While enumerating the countless good offices of corn, permit brief dealing with one of its mischievous powers. Of the two billion bushels crop of 1885, eighteen million nine hundred and twenty-seven thousand nine hundred and eighty-two bushels, or a trifle over seven-tenths of one per cent, was used for distillation. A bushel of corn sells for thirty cents with us, and when converted into intoxicating drink represents seventeen quarts. The distillers receive 40 cents a gallon for converting it into whiskey. It thus represents the original 30 cents and \$1.70 for the distiller, making its value at this stage \$2. Then the government tax of 90 cents a gallon adds \$3.85 to the value, swelling it to \$5.85. By the time it has reached the retailers it has been "reduced" in strength and increased in quantity by the admixture of water, and some more harmful substances, so that its measure has at least been doubled, and the corn, when it begins to drop into the drinkers' glasses on the bar, represents about eight and one-half gallons of drink. Allowing 60 drinks to the gallon, the official bar average, the bushel of corn will furnish 270 drinks, which, at an average of 15 cents to the drink, will take \$40.50 cents from the pockets of the consumers; this, added to the \$5.85 put into the corn up to the time of reaching the jobbers, making a total of \$46.35. Subtract the 30 cents which the farmer received for the corn, and the balance, \$46.05, will show the amazing profits made by those who do not till the soil to raise the corn, but who multiply infinitely by scientific means the evil powers of the grain, and who from this hurtful multiplication reap easy, large, and reliable profits. The original price of the bushel of corn is contained 155 times in the ultimate receipts from it. In this way the enormous wasting power of alcoholic drink can be easily understood. Political reformers and statisticians, who

talk so learnedly about "hard times," appear to have skipped such calculations as these. It may not be out of place to state that in 1880 there were 99,997 insane persons, 76,891 idiots, 88,665 paupers, 59,255 prisoners, or 316,812 persons, every one of whom can trace a portion, at least, of his trouble to liquor.

CONCLUSION.

It was originally my intention to have prepared, in connection with this paper, a chapter relating to soil, particularly as to the importance of keeping up its maximum producing power; but it is already of quite sufficient length for one sitting of an audience. Suffice it now to say, the thrifty, successful manipulator of the soil will not permit its desirable quality to deteriorate—will keep it up.

While I believe, with good treatment, the soil peculiar to the great slope reaching from the base of the Rocky mountains to the Missouri river will continue to reward the intelligent husbandman with crop yield in abundance, and longer without perceptible diminution than almost any other, the Creator never made a soil that would not depreciate and eventually wear out, without recuperative efforts on the part of the tiller. To expect otherwise would be to ask Him to set aside His fixed laws to accommodate an already bounteously provided for section of country. We may as reasonably expect that a single bank deposit might be drawn from for all time without replenishing. In plain parlance, soil needs to be fed the same as cattle and hogs, if like results are sought to be obtained.

GLANDERS AND FARCY.

PAPER READ BEFORE THE NEBRASKA STATE BOARD OF AGRICULTURE AT THEIR ANNUAL MEETING, HELD AT LINCOLN, NEBRASKA, TUESDAY, JANUARY 18, 1887, BY DR. J. GERTH, JR., STATE VETERINARIAN.

Mr. President, and Gentlemen of the State Board of Agriculture:

Your worthy secretary kindly requested me to prepare and read a paper on some appropriate subject before this body, at this, your reg-

ular annual meeting. After deciding to do so, I at first felt inclined to address you on the subject of contagious pleuro-pneumonia among cattle. But as this subject, although important and interesting, was so thoroughly ventilated by the press of the country within the past four months, and as our state is still free from this disease, and, I may add, as well, if not better, protected from infection than any other state in the Union, I could hardly think of a subject that at the present time would prove more interesting than that of glanders and farcy.

In preparing my subject I referred to the works of Gerlach, Roell, Haubner, Williams, and others.

Glanders, a most loathsome and dangerous disease of horses, asses, and mules, might be said to have existed to an alarming extent among the equines of our state. This may be accounted for largely because the public failed to recognize the disease, and because of the prevailing ignorance of it among the majority of the practicing, and in many cases unscrupulous, empirics, the traffic in cheap and diseased horses previously tolerated, and by reason of the state having been neglectful of its duty in the past.

The origin of glanders is unknown. It is lost in history.

It is claimed by some authors that glanders was first described by Aristotle, and by others, that Apsyrthus, who lived in the fourth century A.D., is entitled to this credit.

In olden times it was believed that glanders in the horse and syphilis in man were one and the same disease. In fact, syphilis in man was supposed to have been caused and contracted by persons having improper connection with glandered mares. It is thought that this idea originated in the sixteenth century, when there was a simultaneous outbreak of glanders among horses and syphilis among soldiers at the siege of Naples. Experiments of late years, however, have proven beyond a doubt that this idea was erroneous, because man, if inoculated with glander virus, will not develop syphilis, nor will a horse develop glanders if inoculated with a syphilitic virus.

Until recent years numerous writers believed in the spontaneous development of glanders, and that it could originate under circumstances that would induce constitutional debility, such as exposure,

hard labor, poor food, and improper habitation. They also denied its contagiousness.

To-day there are but few members in the profession who believe in its spontaneous origin, and the theory of contagion has been generally accepted. Glanders, although found in all climates, is not of common occurrence in northern countries, where there is little or no intercourse with the civilized world.

Glanders and farcy may be defined as a contagious disease, peculiar to the equine family. It is transmittable to man, and all domestic animals except cattle. Glanders and farcy are only different forms of the same constitutional disease affecting horses. If a sound animal be inoculated with the matter of glanders and farcy, it may produce either one or the other manifestation or both. The disease, although usually chronic, will frequently terminate in acute glanders before death.

The infectious element of glanders has a fixed character, and, as experience proves, it may be suspended in the atmosphere. This explains the rapid communication of the disease from animal to animal in an infected, overcrowded, poorly ventilated, and imperfectly drained stable, where the air soon becomes loaded with the infectious principles by means of the expired air from glandered horses. In open fields and pastures the disease does not spread so rapidly, and is rarely communicated, except by direct inoculation, because the contagion is soon sufficiently diluted as to become harmless.

In this, as in other contagious diseases, a small percentage of the exposed animals will not become infected. This may be dependent upon the virulence of the glander poison, or upon the general condition of the animal at the time of the exposure. Animals in good health do not seem to be so susceptible to infection as those that have had their constitution weakened by improper care, feeding, exposure, etc.

The infectious element of glanders is disbursed through the system by means of the blood.

The virus of glanders may, under favorable circumstances, retain its activity for a long time. Boiling water, fire, chemicals, and certain

disinfectants will thoroughly destroy its activity, when brought into actual contact with the same. It is also claimed that putrefaction will have the same effect.

The period of incubation in glanders varies from three to six days to as many weeks.

Glanders, in its chronic form, may continue for months and years before terminating in death, while acute glanders may cause death in from five to fifteen days.

The symptoms of glanders are inaugurated by a scanty, rarely copious discharge from one or both nostrils, aqueous at first, afterwards glaring, and gradually assuming a brownish-yellow color. The discharge, intermittent at times, is usually continuous. It is of a sticky, glue-like nature, and at times is streaked with blood. It adheres to the outer edges of the nostrils, and sometimes clogs up the nasal air passages to such an extent as to cause difficulty in breathing. The discharge is not offensive, except when ulceration has taken place to such an extent as to destroy the cartilage and other tissues of the head, or when there is necrosis of the bones of the head, or a decayed tooth, present also. The discharge is said to be the most frequent from the left nostril. I have seen it as frequent from the right, and from both nostrils as from the left. The discharge is the most common carrier of the contagion. The sub-maxillary gland or glands are enlarged, hard, and painless to the touch, gradually becoming adherent to the bone, and do not show any disposition to suppurate or disappear. There is also tumefaction of the nasal cavities and swelling of the lymphatic glands of the head and legs. Frequently also an accumulation of whitish mucus in the corner of the eye, on the diseased side of the head.

The principal symptom, however, which leaves no doubt as to the existence of glanders, is the formation of chancrous ulcers on the lining membrane of the nose (Schneiderian membrane, or Septum nasi).

Frequently the septum of the nose assumes a peculiar leaden hue, and small gray spots (glander nodules), varying in size from a pin's head to that of a pea, make their appearance, and precede the formation of glander ulcers. The ulcers rapidly increase in number, and extend along the larynx and trachea. They have a yellowish, fatty

base, and a pinkish, ragged-edged elevation. Sometimes they are deep seated, and frequently will eat through the septum, leaving a hole about the size of a twenty-five cent silver piece, through which one's finger can easily be passed from one nostril to the other. The ulcers generally are unhealthy in character, but sometimes will show a disposition to heal. When healed, scars radiating from a central point (stellated scars) remain, of a white color and in striking contrast with that of the other portions of the membrane. Should all external symptoms be absent, the presence of glander ulcers would make the diagnosis a certainty. Ulcers can generally be seen on the lower or anterior portion of the septum; at times they will not develop at that point, but will form on the upper or posterior portions, where they cannot be detected.

In cases produced by inoculation ulceration usually follows in from four to twelve days after the appearance of the nasal discharge.

External glanders or farcy, known among the laity as "Button Farcy," manifests itself in the skin of the diseased animal. It is ushered in with a slight febrile disturbance, but this symptom may be so slight as to escape observation. In most cases the disease indicates itself by the appearance of small knots and cords on the legs, shoulders, and face, swollen lymphatic glands and ducts. The knots break out into deep yellow-edged ulcers called farcy buds.

When the constitution of the patient is good, and other circumstances are favorable, this form of glanders does not appear in a very virulent form; in fact, sometimes the disease seems at a standstill for weeks and months, and it is believed by some authors that when these conditions are present the animal may recover.

Another form of farcy that may appear is that of "Farcy Tumors." The tumors vary in size from a hen's egg to a man's fist, and are generally located on the haunches or croup, and never exhibit any tendency to ulcerate. Appearing suddenly, they are hard, at first a little painful, and always well defined; they soften rapidly, though they have rarely been observed to open spontaneously. When punctured, the discharge that escapes is thick, slightly yellow, and creamy.

According to the rapidity with which the symptoms of glanders develop it is termed acute or chronic.

These two forms of the disease may be observed in the same animal singly, simultaneously, or successively.

In the horse it generally appears in the chronic form; in the ass and mule it is most frequently acute.

In acute glanders the above mentioned symptoms are usually very prominent. Acute glanders is generally ushered in with a slight fever. It does not invariably develop from the chronic form, and may be present from the first. In acute glanders the appetite is lost and the animal emaciates rapidly until death closes the scene.

In chronic glanders many of the previously mentioned symptoms are absent, and but two or three are present, viz., a scanty, glue-like discharge, enlarged sub-maxillary gland, and ulceration on the septum of the nose. Nevertheless, when these three main symptoms, or only two of them, are present and fully developed, the veterinarian is justified in making a positive diagnosis.

Animals with chronic glanders, generally remain in good condition, and retain their appetite.

Occult (pulmonary, latent) glanders, on account of its obscurity, must be considered one of the most dangerous forms of this disease. Sometimes it can be suspected, but rarely diagnosed, and then only upon circumstantial evidence.

It happens frequently that a horse may have glanders and communicate it to other animals without showing a single symptom which would lead one to suspect the disease. Numerous such instances are on record. As some are very interesting, I will quote a few.

Dr. Detmers reports the following:*

"The late Professor Spinola, in his lectures on veterinary pathology at Berlin, related such a case to his students, which will serve as an illustration. It is substantially as follows: In a village near Berlin, glanders broke out in a stable in which several horses were kept. A veterinary surgeon was called who made an investigation, and condemned every horse that showed any symptom of the disease, and every animal condemned was immediately killed. The horses apparently not affected were kept for several weeks under police control, and from time to time inspected, but finally released. Among them

* See Special Report No. 12, U. S. Department of Agriculture.

was an old sorrel horse which had the heaves, and which had been brought into the stable a short time before the first case of glanders made its appearance. This sorrel horse soon after was sold to a man in another village, and came into a stable containing also quite a number of horses. In that stable, too, glanders broke out. The veterinary surgeon (another one) was called, and every horse showing symptoms of glanders was condemned and immediately destroyed. The old sorrel horse, however, which was known to have the heaves, was again released after some length of time, together with those which had remained exempted, and was sold once more, this time to a man who kept over thirty horses in his stable a few miles from the city. In this last stable glanders likewise made its appearance after some lapse of time, but in that case Professor Spinola was called. He, too, after a careful investigation, condemned every horse that showed any symptom of glanders, and insisted upon condemning the old sorrel horse also, whose history was then unknown to him, notwithstanding that no symptoms of disease except such as are usually attendants of heaves could be observed. The owner hesitated to consent to the loss of a horse apparently not affected with glanders, but Spinola insisted upon the condemnation.

“The *post mortem* examination revealed that the old horse which had the heaves was affected with pulmonary glanders in a high degree, and Spinola, after learning the history of the old sorrel, was convinced that the latter had caused the outbreak of glanders in all three stables.”

I remember a similar case, though not so striking as the one just related, in a horse at Greenwood, Nebraska, owned by Mr. H—. This also was a sorrel horse, a fourteen-year-old gelding. This horse occasionally had a scanty discharge from the nose for several years, which was attributed to a slight cold. He remained in good condition, had a good appetite, and was worked daily. Three horses, purchased from time to time, that were worked with him all died with what was believed to be, and undoubtedly was, glanders. I examined this horse in the month of August, 1885, and as by that time several symptoms of glanders had developed, I ordered him destroyed. How many animals were inoculated by this horse I could not learn,

but judging from the large number of glandered horses found in that vicinity I sometimes think this horse inoculated nearly all in that neighborhood.

I can recall another case in a horse at the stables of a horse railway company in Newark, N. J., during the summer of 1883. This horse was not suspected until after the destruction of over one hundred of their horses. After considerable discussion, pro and con, by the veterinarians in charge, the animal was finally killed by the authorities, and the *post mortem* revealed a most interesting case of pulmonary glanders. After the death of this animal but three new cases of glanders developed in the stables. I have always attributed the outbreak to this horse.

Several other interesting cases might be cited, which to relate I fear might tax your patience.

Of such cases it might truly be said, "It is a pestilence that walketh in darkness."

To examine a horse for glanders, place him in a stable facing an open door, cause an attendant to raise his head so that the light will shine up the nostrils. The examiner should stand a little aside, and with his thumb and first finger dilate the nostril so that the inside of the nasal cavity may be exposed to view. Ulcers, if present, can easily be seen; if not, any nodosity can readily be detected by passing the finger over the schneiderian membrane. Persons with wounds or excoriations on their hands or face should have nothing to do with the examination of a horse suspected to have glanders or farcy.

On making a *post mortem* examination, the mucous membrane lining the air passages of the head is generally swollen, occasionally covered with hard nodes, and radiating cicatrices, or stellated scars, and glander ulcers. The ulcers frequently extend to the larynx, trachea, and the larger bronchial tubes. The sinuses of the head are filled with a thick, yellowish, viscid material. Glander tubercles are found in the enlarged glands and in the lungs, isolated or in large numbers. The liver and kidneys are "shrunk," and may be filled with caseous or calcified tubercles.

Distemper, catarrh, and nasal gleet are diseases sometimes mistaken for glanders.

In distemper the horse is sick, off his feed, and very feverish. The sub-maxillary and parotid glands become inflamed, suppuration soon takes place in the surrounding tissue, terminating in an abscess. With good nursing and proper treatment the animal rapidly recovers.

Catarrh, or common cold, is an acute inflammation of the mucous membrane lining the air passages of the head. It is the same as cold in the head in the human subject. The discharge from the nostrils is watery. The animal recovers speedily.

Nasal gleet is the name given to a chronic discharge from one or both nostrils. It is generally intermittent, rarely continuous, and not of that sticky, glue-like, and adherent character peculiar to glanders. Ordinarily, the matter is white, and of the thickness of cream. It falls freely from the nostrils. Nasal gleet is seldom associated with an enlargement of the glands, and if enlarged they do not adhere to the bone. The septum of the nose is free from ulceration. If the trouble has not become chronic, it will submit to treatment.

As glanders is an incurable disease, all medical treatment is useless. In ancient days it was believed that the disease could be subdued if not cured by therapeutical agents. In the seventeenth century it was a common practice to have not less than ten drugs in one prescription. The compounding was generally done in the most unscientific manner, and the most violent remedies were employed. All the active poisons have been employed again and again without success. In pursuance of this blind, empirical plan, and in the vain hope of finding a specific, the various preparations of arsenic, antimony, zinc, copper, mercury, etc.; also hellebore, aconite, digitalis, hyoscyamus, belladonna, cantharides, capsicum, and numerous other drugs were tried, but all to no avail.

The only rational treatment consists in the immediate destruction of all glandered animals. By invariably adopting this treatment, glanders can be thoroughly eradicated and the state freed of this most loathsome disease, dangerous to both man and beast.

Stables in which glandered animals have been kept should be thoroughly disinfected. The stables should first be vacated and cleansed of manure and other refuse, including fodder and litter of every kind that may cover up the infected matter. The walls and partitions should be well scraped and washed with boiling water. The floor, if

of wood, should be taken up and destroyed, at least six inches of the dirt beneath the floor should be removed and replaced with fresh earth. Mangers, hay-racks, feed-boxes, curry-combs, brushes, water-pails, and all refuse should be burned. After the barn has been thoroughly cleansed, it should be closed up tightly so as to exclude the outer air, and fumigated with the burning of roll sulphur,* or sulphur bricks.†

To fumigate a barn, break up the sulphur in small particles, place them in an iron plate or metallic dish, set it on fire, then leave, closing the door behind you. A pound of sulphur should be sufficient for 1,000 cubic feet of space. Keep the barn well closed for at least three hours after the burning has ceased, then air well for several days, and afterward whitewash all woodwork with a mixture containing four ounces each of carbolic acid and chloride of lime to each gallon of whitewash.

Painted iron and woodwork, after being thoroughly cleansed, should be repainted.

To disinfect harness, robes, grain-bags, blankets, and all textile fabrics, including ropes used about diseased or suspected animals, boil in a solution of carbolic acid (two ounces of the acid to one gallon of water), or fumigate with sulphur as described above.

All feed, hay, and straw should be used cautiously, or fed to cattle.

In Nebraska, notwithstanding that the state authorities have caused three hundred and sixteen horses (animals and mules) to be destroyed, on account of glanders and farcy, within the past eighteen months, and succeeded in thoroughly eradicating it in several localities, the disease is still quite prevalent. It will pay every horse owner to be careful in buying or trading for a horse, especially if the animal is running from the nose and has an enlargement under the jaw.

I would also advise that no horse be purchased except from responsible and honest dealers, and in cases of doubt, first to have the animal examined by a competent veterinary surgeon.

* If roll sulphur is used, a little alcohol should be added before setting it on fire.

† Manufactured by Parke, Davis & Co., Detroit, Mich.

EXPERIMENT STATIONS.

A PAPER READ BY PROF. H. H. WING, OF THE NEBRASKA INDUSTRIAL COLLEGE,
BEFORE THE WINTER MEETING OF THE NEBRASKA STATE BOARD OF AGRICULTURE.

Webster defines an experiment as "a trial deliberately instituted, an act or operation undertaken in order to discover something unknown, or in order to test, establish, or illustrate some allied or known truth." Taking this definition as our basis, we see at once the broad range of work that is properly included under the term agricultural experiment. In the minds of a considerable number of persons, the term agricultural experiment seems to be inseparably connected with numerous small plots of land upon which are grown various crops under the multitudinous permutations and combinations of change in seed, treatment, fertilizer, and so forth. Such experiments, while good enough in their way, are often of quite limited application, even if all the details are carefully carried out. But the meaning of the term should not be limited in this way, since there is scarcely a fact in any one of the great natural sciences that does not have a direct bearing on the solution of some practical problem of the farm.

Since to experiment is to test, establish, or illustrate, experimental work divides itself very naturally into two great classes. The first we may call illustrative experiments, or experiments designed to illustrate some point already established, or compare varieties, breeds, and individuals; and the second demonstrative experiments, or experiments intended to discover some fact or measure, some influence, the force of which has hitherto been unknown.

Of these two classes, the first is less expensive, takes less time for the attainment of results, and the results when attained are more sure of popular appreciation. At the same time the results are not likely to be of wide application as to locality or time. Under this class come all comparative tests of different varieties of grasses, grains, fruits, and vegetables; all tests of different methods of cultivation and treatment of various crops; all tests as to comparative merits of different fodders, etc, etc.

Experiments of the second class usually require more time for their completion, require more continual care during their progress, and more elaborate apparatus and equipment. The results are often only attained after many repetitions and the exercise of constant care and watchfulness, but when attained are true for all times and for all places. In this class may be included all investigations into the cause, history, and prevention of all plant and animal diseases; all investigations into the processes of plant and animal growth and development; the determination of the digestibility of foods, etc., etc. To the outsider the benefit of the illustrative experiment comes very largely in watching it while it is in progress, while he must depend upon the experimenter for a record and interpretation of the other class.

With agricultural experiments and experiment stations, as with all other works and institutions of a public nature, the criticism is often made by well meaning but unthinking persons that the results accomplished are not adequate to the time and labor employed to bring them about; that results are not reached rapidly enough, and various other things of like nature. But there are few persons other than those employed in the work who have ever carefully considered the difficulties and perplexities that lie in the way of the experimenter. An agricultural problem that is to be solved by experiments is like an algebraic one in which there are two or more unknown quantities. As in algebra we must eliminate x from our problem before we can find the value of y . For in general we can solve only one unknown factor at a time. It is true, as in algebra, we may assign some value to x in order to determine y , but we are not at all sure that the value we assign to x in 1886 will hold true for 1887, or that the value we may give x in Nebraska will be at all near the value x should have in New York. Not only is the experimenter beset at every turn with conditions whose value is unknown or undetermined, but there are in nearly every case many forces affecting the result that are wholly unknown to the experimenter. Perhaps I can give a better idea of this by an illustration. In the year 1882, the first year of the New York agricultural experiment station, a trial was made of the effect of a fertilizer upon a crop of corn. Four series of five plats each were planted with different

varieties of corn; each plat of the series was given fertilizer as follows: nothing, 200, 400, 800, and 1,600 lbs. per acre of a certain concentrated fertilizer. The resulting crop showed that in no case was there a difference of more than 20 bushels per acre in the crop, but that in many cases a plot heavily fertilized gave less crop than one of the same variety with less fertilizer. Now this did not prove that it did not pay to buy fertilizers for corn, for the farmers in that locality had before found profit from the use of this fertilizer, and have continued to do so since, but it did show that there were some, and perhaps many, influences at work that were more powerful than those whose force it was desired to determine.

It would no doubt be of great practical value to us, as feeders, to know the digestibility and feeding value of the various nutrients in our fodders; but though many experiments have been carried out with individual animals, still the individuality of the animal has interposed such a barrier to useful generalizations that some of our best and most careful investigators have questioned whether more useful results might not be obtained in the laboratory with artificial digestion fluids. Another difficulty that enters into all experimental work that has for its result the comparative development between plants or animals, or classes of plants or animals, is the well-known fact that no two individuals will attain the same development, even though placed under precisely similar conditions. Dr. Manly Miles illustrated this very nicely. He took a small field apparently uniform as to soil and other natural conditions and planted it to corn. The whole field was treated precisely alike in all the operations of planting, cultivating, and the like. When harvest time came the field was divided up into numerous small plots and each plot harvested separately, the result being that there were wider variations in the yields of the different plots than there are commonly between plots receiving widely different treatment.

In the light of all these difficulties, and as I said in the beginning, because there is scarcely a fact in any of the great natural sciences that does not have a direct practical bearing on some agricultural problem, it is plain that our most important "agricultural" experiments are those that discover, develop, or confirm some scientific fact.

In any line of experimental work, the collection of data and the recording of observations, though often overlooked, are matters that are of the utmost importance. The value of full meteorological records is just beginning to be appreciated. If we had continuous records for the past 100 years in the various localities, we might do much toward giving a fixed value to many of those unknown influences which so affect our experiments with field crops. Nearly all questions relating to stock-breeding in the matter of heredity, in-and-in breeding, and so forth, will require a long series of carefully made and recorded observations on a large number of animals for their proper settlement. So with a great many other of our farm problems; systematically made and recorded observations will throw much light upon apparently obscure points.

THE EXPERIMENT STATIONS.

When Liebig, in 1840, proclaimed his "mineral theory," that is, the relation between the ash of plants and the mineral elements of the soil, the first popular interest was awakened in agricultural chemistry in Germany. This feeling was increased by the introduction of commercial manures into England shortly afterwards. As an outgrowth of this interest, the first agricultural experiment station was established at Moeckern in 1851, and Dr. Emil Wolff placed in charge. Almost from the first these institutions on the continent of Europe have been supported by the government, though some are maintained by agricultural societies and some by private enterprise. The average amount received from the government is about \$2,000 per year, and the work done is very largely chemical. The experiment stations in Germany from the first have controlled and regulated the sale of commercial fertilizers and fodders, and the trade in seed. From the station established at Moeckern in 1851, the work has spread throughout Europe and America until there are now probably between 150 and 200 stations in existence. In England the munificence and enthusiasm of a single individual (Sir John B. Lawes) has established and maintained one of the best known of all experiment stations. The work of Sir John B. Lawes and Dr. Gilbert, at Rothamstead, upon the exhaustion of the soil will long stand as a monument of patient and painstaking labor.

In this country the first station was established by Connecticut in 1875 or 1876. Its establishment grew out of the frauds that were being perpetrated on the farmers of that state in the sale of commercial fertilizers. Stations were established in New York, New Jersey, Ohio, and North Carolina about 1882, and since then there have been established stations in Massachusetts, Alabama, Wisconsin, and Maine. All these are supported entirely by the state, but there are at least two private stations in this country that have done good work. One at Mountainville, N. Y., supported by Mr. Lawson Valentine, and one at River Edge, N. J., supported by Mr. E. S. Carman, the editor of the *Rural New Yorker*.

So much for the establishment of these stations. The fair question now is, what have they done? We are indebted to the stations of continental Europe especially to the one at Tharandt, in Saxony, for nearly all the information we possess in regard to the elements the plant takes from the soil. The investigations of Dr. Emil Wolff constitute almost the whole of our knowledge of the digestibility of fodders. From the work of Messrs. Lawes and Gilbert, at Rothamstead, we draw much of our information in regard to exhaustion of the soil. The experiment stations in this country have been established scarcely long enough to expect very much in the way of results. The work of the eastern stations, except the one in New York, has been mainly in the control of the sale of commercial fertilizers, and they have succeeded in securing to the farmers of their respective states an article whose composition is reasonably well known. The Wisconsin station has proven that the wheat bran made by the roller process, contrary to general belief, is more nutritious than that made by the old process. The New York station, by its germination tests, has done much to improve the quality of seeds sent out by seedsmen; it has by hybridization produced at least one new fruit worthy of general dissemination; and more important than all, has definitely settled upon the cause of that mysterious disease, the apple and pear blight. These are a few of the results that have received the most attention, but I might go on for pages with an enumeration of experiments, the results of almost any one of which would more than balance the entire expense of the station making it.

THE TRUE RELATIONS OF THE VETERINARY PROFESSION TO THE LIVE STOCK INTERESTS OF THE STATE.

READ AT THE ANNUAL MEETING OF THE STATE BOARD OF AGRICULTURE OF NEBRASKA, JANUARY 19, 1887, BY ESPECIAL INVITATION, BY FRANK S. BILLINGS, D.V.M.

Mr. President and Gentlemen:

Such meetings as this should always have some direct purpose, and our coming together this evening is by no means without such a purpose.

That purpose is:

Shall the state of Nebraska found a veterinary school, and if so, what kind shall it be?

At your last annual meeting you voted that such an institution was necessary, and, what is of still more importance, you expressed the desire and determination that such a school must be as scientifically and practically perfect as money and human knowledge and energy can make it, in order that it fulfill all the requirements of the state.

To-night, or at this meeting, it is for you to decide if you are still of the same opinion.

For the past six months it has been my agreeable duty to endeavor to instruct the agriculturists of Nebraska as to the methods which have been employed, or better perhaps, the forces which have been at work in bringing the best veterinary schools of the world to their present degree of perfection. I have endeavored to show you that these forces were exactly the same as have been, and are now, at work in Nebraska; that they were the same which have led the farmers of Nebraska to demand the establishment of a veterinary school by the state, viz.:

1. The protection and preservation of your live stock from disease.
2. That the present veterinary profession is incompetent to this work and that you need to create one especially educated for it; and

further, the means of keeping it constantly up to the demands of the state.

3. That the only means to this end is a veterinary school supported by the state; guided and directed according to the necessities of the state; the qualifications of its graduates regulated by the state, and guaranteed to the people by the state.

It is to be hoped that my endeavors have been successful in preparing the way for our work this evening. That our retrospective studies are over for the time being. That all we have now to do is to look ahead and go ahead.

In other words, our task this evening is to consider the present and future necessities of our state and the best means of meeting them.

You, as representative farmers of Nebraska, have now to say exactly what you want. You have to inform the regents of your university of the exact nature of your wants.

In this regard you must be very particular.

If you really appreciate your necessities as owners and breeders of live stock, and really want the most competent veterinary school the example and experiences of the world can give you, you must say so in no uncertain language. You, farmers of Nebraska, are responsible for what this school shall be, and not the regents of your university. They are but the servants of the state, and as you form the chief power in the state, they are your servants. They will do what they are asked to the best of their ability. The state must give them the means. As you represent the most vital interest to the prosperity of the state, it is your responsibility to see that the means thus offered are equal to the necessities of some eighty million dollars worth of live stock.

"Money talks," gentlemen! And as you represent the equivalent of eighty millions of money you should be able to make it "talk" as you want it to.

There should be no difficulty in getting all the appropriation necessary for the establishment of your veterinary school, as well as the protection of your live stock interests from disease by a veterinary police force and laws suitable to the present needs.

After you have made your wants known, the regents of your uni-

versity must go to the legislature for the means to build it and inaugurate it. You must go, too, and back up your own demands. In such a matter I can do nothing. I want nothing except the opportunity to give my life's energies to your protection and service; that is, unless you find somebody else you would prefer. I want your confidence and the opportunity to work. Nothing more.

Farmers of Nebraska, do you realize what a peculiar and honorable position this act of yours will place you in when the history of this century shall be written?

Do you realize that this is the first time in the history of the world when an influential body of men, representing the greatest of all national interests (agricultural), have presented themselves before their government and demanded that that government establish an educational institution in order that the youths of the state may become so educated as to be reliable protectors of that interest?

Historically speaking, no class of men have ever given a stronger public demonstration of their intelligence than this act of yours.

Historically speaking, it may mean more to the future development of our country, from the scientific educational point of view, than any other event that has ever happened.

It may and shall mean, so far as my feeble efforts can contribute to the work, the planting of a seed that will bear such fruit that its sprouts will extend to Washington and lead to the establishment of an American university replete in the various scientific schools, so necessary to the progressive development of any nation.

To see such a university established and to contribute somewhat to the work, is the secret of my ambition; the one focus upon which all my endeavors are concentrated.

This is why I am so indebted to you for the opportunities you have given me of working for you. The devotion of a life could not begin to repay such indebtedness. This is why I am so interested in the school you have demanded and the preservation of your own live stock.

It is that Nebraska may set the example to the whole country.

So much for an introduction.

To repeat: the reason of your coming here this evening then is, the

establishment of a veterinary school by the people of Nebraska, for the people of Nebraska. That is, a state veterinary school, the purpose of which shall be indicated by the necessities of the state; a state veterinary school the management of which shall be delegated to persons elected by the people of the state.

Why have you, as representative citizens of Nebraska, made this demand upon the government of your state?

Was it that you thought that you needed more veterinarians? Or was it that experience has taught you that you require better qualified veterinarians in order that the interests of eighty million dollars which you have invested in live stock should have the best possible protection from the ravages of preventable diseases?

It was not that you know, what everybody knows, that the veterinary profession offers a means of livelihood to your sons or somebody else's sons.

Had that been the reason you would never have said that you wanted the best veterinary school money and human abilities could give you.

Your reason was that you felt that it is the duty of the state to protect this eighty millions of capital invested in live stock from disease, and that this protection could only be guaranteed by the state, when it supplied itself with scientifically qualified veterinarians and was itself responsible for their education. A prosperous and wealthy state must of necessity mean a healthy condition of its people, both bodily and financially. Hence, no one can deny that it is the duty of the state to protect its wealth in every possible manner.

In Nebraska this wealth is almost entirely represented by the live stock in the state.

The geographical position of Nebraska and her climatic and telluric conditions indicate that this state is destined to become the greatest feeding and fattening state for live stock in the Union, if—

If what?

If the government of Nebraska offers the necessary conditions for the proper protection of that live stock from disease.

If she does this, she not only protects the invested property of her present citizens, but such an exceptional and important fact must or

necessity become known and contribute largely to the future welfare and development of the state.

Citizens of other states, especially farmers, who are dissatisfied with their conditions; immigrants from Great Britain and Europe, with means to invest, will naturally ask themselves "Where shall we go?" "What state offers us the most favorable inducements?"

They will carefully take into consideration the nature of the land, water supply, climate and railroad facilities; but you may be very sure, and your legislature may be equally sure (both present and future), that the questions above all others which are soon going to decide where such people will go (with reference to the states west of the Mississippi) will be:

Which of all these states offers the best guarantee that our live stock will be properly protected from disease?

Which state has the best veterinary police organization and laws for the prevention of disease among animals?

Which state has the best organized veterinary school? Which institution can alone guarantee to us that this work will be properly done, not only in the present, but always?

That state must be Nebraska!

Gentlemen, you can easily see that this question of the establishment of a state veterinary school is of immeasurable importance to the present and future welfare of our state.

It is a question the consideration of which demands the very highest qualities of statesmanship.

It is, shall our state continue to prosper and develop, or shall it not?

The proper protection of the live stock interests of Nebraska means prosperity to the farmers, upon which depends the prosperity of her railroads, brokers, merchants, packers, and manufacturers.

With hog cholera robbing the farmers of Nebraska of millions; with the contagious lung plague once domesticated among our cattle (it is sure to become so unless the national government wakes up; or what is far more liable to protect us, that we at once improve our veterinary police laws and increase the number of our veterinary police officials, as well as their quality); with anthrax, blackleg, and Texas

fever continually causing more or less animal loss; with glanders not sensibly diminished among our horses, notwithstanding the number killed during the past year at an unnecessary expense to the state and with no just remuneration to the owners; with these devastating agents still in full force and the state without any better means of preventing their action than she possesses at present, what would be the effect upon the business interests of Nebraska other than live stock?

You need scarcely be told that immigration would be seriously diminished; that your railroad yards would be full of empty cars; that your bank vaults would be full of money and business dead (because the necessities and prosperity of the farmers make the prosperity of your bankers). This unfortunate condition would extend to the merchants of every description; the manufactories and packing houses would be more or less idle; in fact, a general business stagnation would prevail.

Gentlemen, have I drawn too imaginative a picture?

Have I not rather brought to your minds many unpleasant experiences which some of you have passed through?

Have I not sufficiently demonstrated that this question (of the protection of the live stock of Nebraska from disease) is one of the broadest statesmanship? That it matters nothing in comparison (to Nebraska) what becomes of the two great national parties in politics, or who is—to be—the next senator at Washington?

This question is for Nebraska legislators to decide for Nebraska alone.

While a question of vast importance to the whole country, the protection of the live stock interests of Nebraska is a matter which Nebraska alone is most vitally interested in.

The question is, however, one which comes more directly home to the farmers of Nebraska than any other class of citizens.

I want to see the whole country pointing to Nebraska as a model in this direction. I want to hear them say, "See, they have no hog cholera in Nebraska;" and I tell you, gentlemen, that if I live, and your legislature does its duty for the live stock interests of the state, that the key to that problem shall be completely welded before the next winter's snow begins to fly. We have the rough key already

well welded, but it wants a good deal of touching up, here and there, and much polishing before it will turn so smoothly in the lock as to completely and securely close the door against this thief breaking through and stealing your property. The citizens of the other states must be made to say, "There is not only not a case of contagious pleuro-pneumonia in Nebraska," but also that "It is impossible for one to enter the state, because they have such an efficient veterinary police organization in Nebraska."

How shall these things be brought about?

By the very means which we have come here this evening to discuss. Your legislature must make the way possible.

The veterinary profession, which your endeavors will have helped to create, will do the work.

This brings us to another question.

What is the true relation of the veterinary profession to the state; that is, the people?

This question has many and varied answers.

The work of the scientifically qualified and really practical veterinarian is not of the simple kind that you have been accustomed to see in the graduates of such schools as the country now has.

We must first come to an understanding of what is meant by the veterinary profession.

The mere practitioner, the eminently "practical man," is the most insignificant part of it.

This is not altogether his fault, by any means.

The country has, heretofore, asked but little of the profession, hence its members should not be held responsible if they have but little to offer.

You, gentlemen, have not only demanded more, but have asked for so much more that it will require much of your legislators; more of the regents of your university, and the devotion of all the energies of life to the sacrifice of health, perhaps, on the part of those selected to conduct your schools, in order to meet your demands.

Gentlemen, you have not been small in your demands. You have asked for all the medical knowledge the world has to offer you; for the very best scientific ability and devotion to your interests; for the

most ultra-practical fitness, when you say that Nebraska requires the best qualified veterinarians that can be produced.

Let us consider a moment and see what that means.

1. Instructors—first and always, instructors—but by that we do not mean men capable of teaching only. Such men must be capable of entering into the practical life of every intelligent farmer in Nebraska. What that means will soon be told you. Such instructors must, however, be investigators also, or they would be next to useless for your purposes. The mere teacher is nothing better than a talking machine. Such men can only teach, or repeat, the half-dead, half-erroneous has-been. The present is only momentary, it then becomes the past. The real teacher, the investigator as well as instructor, is a man of such abilities as to be able to take part in creating the living present. He must be equally intimate with the results of past investigations and the conclusions drawn by his predecessors, so as not to be led astray and make erroneous conclusions himself. He must not only be an investigating worker, but an earnest student and profound thinker, so that he may be able to weigh all the evidence upon any given subject and draw correct conclusions.

But he must be able to do more than this to become the competent teacher.

He must be able to practically apply the knowledge thus gained to the needs of the student and the necessities of the state.

This is what you demand when you say that Nebraska requires thoroughly qualified veterinarians as instructors, veterinary police officials, and practitioners.

You may not realize it, but you have demanded that such men shall be not only qualified professionally, but that they must also possess statesman-like abilities of no mean order.

The work of the men that you are asking for requires that they keep up the most intense study of the needs of the state in everything pertaining to her live stock interests; the improvement of the breeds; the improvement of the methods of stabling and feeding your stock; the matters pertaining to the transport or slaughtering of stock; the nature of grazing grounds with relation to injurious or poisonous weeds or grasses; the proper drainage of the same, so that the stand

of the ground-water shall offer conditions unfavorable to the preservation of the germs of anthrax or other diseases; the care and shoeing of your horses; and last, but by no means of the least importance, they must keep a constant watch over the food-producing animals in the state, the slaughter-houses, and dairies, in order to see that no unsuitable flesh or animal product is offered to the people for their own consumption.

The influence which the qualified and critically observant veterinarian should and can exert upon the live stock of the state, by taking an active part in your so-called "farmers'" and "breeders'" meetings, may not be appreciated, but it is a fact, nevertheless.

The qualified veterinarian must have been thoroughly instructed in all the principles of development and in the causes, so far as known, which have led to a departure from the general type in the different breeds or species. He must know the principles of atavismus, or breeding back, which should enable him to tell you even better than you know yourselves of the dangers to be avoided, and what kinds of weaknesses are more apt to have a certain constancy of transmission than others.

He should be able to instruct you how you can avoid many injuries to your stock, owing to your ignorance of the physiological laws of nutrition, breeding, etc. He should tell you what I now take the liberty of telling you, and what many of you know, that it is costing the farmers of Nebraska more food to keep their stock warm in winter from the exposures they are subjected to than it would to fatten them in any decent kind of shelter; he should tell you that two-thirds of your farm horses are unsound in their fore feet and unsuitable for any Eastern market because of your neglect of every principle of common sense in taking proper care of their feet from their days of early colthood.

Another thing that the competent professor must be able to do is to go into your fields and stables and take in at a glance, or by suitable investigations, the entire nature of all the surroundings of your animals; the light, the air, the drainage, the food, the water supply, the lay of the land, whether wet or dry, whether it has pools or ponds in it, what the weather is and has been; how long your animals have

been sick; where did you bring them from and when; were any of them sick before you introduced new ones; of whom did you buy; are any of his animals sick; to visit his animals in the same way, etc., etc.

In fact, to be a competent field veterinarian absolutely requires, in the present day, that the man be equally competent in the laboratory and the methods of scientific experimentation.

To be a competent field veterinarian to-day the man must know all there is known as to the manner that the disease-producing bacteria live and work, both in and outside of the animal organism; what animals are susceptible to their action, what not; what temperature they thrive in, what not; what soils they live in and what not; what degrees of moisture favor their life and development, what not; what disinfectants, the quantity necessary, and amount of exposure necessary to kill them, and what not.

It requires the ability to arrive at the nature of a given disease when no outward characteristic is present, either by the direct results of an autopsical examination, or, when necessary, by prolonged study and experimentation.

Above all, to be a reliable "field worker" and true servant of the state, the veterinarian must have the attributes of true modesty and intellectual honesty; he must be willing to admit that he does not know—when he does not—as well as possess the will and abilities to find the unknown quantity out.

I do not say that he must do all this scientific work. But he must know all this and be able to do all we have mentioned in order to support the work of the school, and be a professional qualified to do his part in protecting the live stock of the state from disease.

The qualified veterinarian, then, must be the adviser of the state in all matters pertaining to live stock and the investigator after new methods of preventing disease. In this regard you should know that nearly all the prevention which has led to any practical results up to the present time has been due to knowledge gained by the observations of qualified men in the field. By this means we have become acquainted with the nature of many diseases, without having an iota of an idea of the specific cause. This scientific work is of very recent

origin. In this manner we have discovered the external causes, which play the chief role in extending such diseases; how they are spread by contact, by human beings, by offal, by animal products. By making laws, the purpose of which is and has been to prevent healthy individuals, human or animal, coming in contact with such things, it has been possible to drive the "black death" and "bubo pest" out of Eastern Europe; to such restrict the ravages of Asiatic cholera; to keep the yellow fever in its Southern home; to take away the death caused by the "rinderpest"; to almost confine Texas fever to its native plains; to keep the lung plague local (in Europe, not this country), etc. Even the greatest achievement of preventive medicine, the one which has given the direction to our modern researches, the discovery of vaccination by Jenner, was not the result of experimental investigation, but due to Jenner's clever observations in the field and stable, that is, among the dairy people of his district. The veterinary police laws of Germany, of which I recently gave you a translation, are dependent upon the studies of qualified veterinarians in the field and stable.

The men we at present have in the public service of this country are simply "pole-ax" heavers or shooters. They have not added a single iota of knowledge that has been of any value to preventive medicine.

But this is not all you farmers have asked for.

You have also demanded that the state find a means of supplying you with qualified practitioners.

Were this all required the task would be easy. The knowledge necessary to become a successful (to themselves mostly) practitioner in the ordinary ailments of human or animal life is very easily acquired. But to be also of practical service to the state, and to do duty in the greater work of preventive medicine and ably support the work of the school, the same fundamental instruction is necessary as if every student were to become an instructor in such a school or a government veterinarian. Hence it is easy to be seen that, in order to obtain the men necessary to its immediate service as investigating instructors and qualified veterinary officials, it is necessary to educate all students alike, so that proper selections can be made; it is also necessary, as

has been shown, that the veterinary practitioners in the state have the same education in order that they can fully comprehend their duties to the state and support the work of its educational and preventive forces.

The practical forces which the state employs to prevent the outbreak and the extension of contagious and infectious diseases among its live stock are of a two-fold nature, which together go to make up the veterinary police organization of the state. They are:

1. A veterinary police force.
2. A code of veterinary police laws.

Although I personally believe that both of these powers must be of a national character, we will not stop to discuss that side of the question now, but will limit our remarks to the necessities of Nebraska, and consider the best means of meeting them at once.

The state has made a beginning in the right direction by creating the position of state veterinarian, but has made a mistake by tacking on to the position a lay sanitary live stock commission as the executive force.

I greatly regret that the urgent necessities of the live stock interests of Nebraska make it my imperative duty to discuss this "commission" side of the question, because my intentions are sure to be misrepresented, but I have promised to give you my honest convictions. I am not a seeker after office in any sense of the word. My only desire is to serve you farmers and the state faithfully. My convictions upon this point are based upon a more critical and exact study of the questions we are here to discuss this evening than has ever been given them by any man living and with greater advantages to do the work than any other person has ever enjoyed.

What I have to say to you is not only my own honest conviction, but is backed up by the example and experiences of every country in which there is anything approaching a satisfactory preventive veterinary police organization. To assert that I am wrong or biased, is to fly into the absurdity of denying the value of common sense and experience, as well as careful study.

That there is nothing whatever of a personal nature in my criticism and objections to the lay commission, is shown by the fact that

I have upheld the same views for years and energetically opposed the appointment of laymen upon technical commissions, as a matter of supreme political nonsense, and of more injury than benefit to the state, because better work can be done without than with them and with no more expense to the state.

The question why laymen should not be appointed by the state upon a commission for the suppression and prevention of contagious and infectious animal diseases is best answered by asking you one.

Would you advise or countenance the appointing of even the most qualified veterinarians upon a banking or engineering commission, either of which requires specific education and experience to insure competency?

It is scarcely necessary for me to answer for you. You would all say, "No!"

I will ask you another question which will come nearer home to most of you.

Would you advise the appointing of any of the veterinarians you are acquainted with upon a committee or commission to consider the best breeds of Shorthorns or any other animals, and the best methods of crossing them, in order to obtain the best practical results to yourselves, as farmers and breeders?

I need not answer that question for you. The skeptical smile on many of your faces is a most emphatic "No!"

You would say that such men could know nothing about such work; that they had not been fitted for it, either by education or experience; and hence were unfitted to be trusted with it.

In the same sense, the live stock interest of the state should say to its executive authorities, "that men who know nothing about the real nature of disease; that men who do not know how to distinguish one pathological change from another; that men who do not know how to distinguish between disease phenomena, which resemble each other; that men who know absolutely nothing about the nature of the causes of contagious and infectious diseases; that men who know nothing about the biological or morphological characteristics of disease producing germs; that men who know nothing of the history of preventive veterinary medicine or of the veterinary police laws, or organ-

izations of the world; that such men are totally and absolutely unfitted to do the work of any state requiring just those abilities in order that the work of protecting its live stock shall be intelligently performed."

Mind you, farmers of Nebraska, it is the efficient public service of the state that we are really discussing. It is not my ideas or any other single individual's.

Those I have placed before you, are those of the intelligent thinking men of the world, and of governments, that have given hard study to these questions and suffered more bitter losses for years and centuries than you have felt in all the years of your existence as a state.

The "rinderpest" has caused more loss and devastation in Europe in a single year in the past century than all the losses from all animal diseases at present cost the United States in any single year. If you can look back to the year 1872 and remember the horse epizootic which extended from ocean to ocean, from the north to the south, and then think what the effect would have been if ninety out of every one hundredsick had died, you can gain some idea of what the "rinderpest" once was to Europe, and by comparing its damages now with those you can see what a qualified veterinary profession has done for the world in comparison to the work of the empirics and laymen of the last century.

You have only to look at the progressive extension of pleuro-pneumonia in this country, with its local restriction in Germany to make a similar comparison.

The day has finally come when government veterinarians in this country must possess all the scientific qualifications which have been named to you, either to receive an appointment in the service of the national or state governments, or retain the position they at present occupy.

They are next to useless without them!

"What then do you propose?" you ask me.

I will tell you with the distinct understanding that its practical adoption does not depend upon me, but upon the farmers of Nebraska and her legislators.

I will only give you ideas that are practically possible, but which

to fully attain will require time and practical guidance. In order to do so, it is necessary to anticipate a little and to assume that we already have a properly organized veterinary school in connection with the other educational institutions of the state.

The faculty of the school should constitute the technical board or advisory veterinary council of the state government in all matters pertaining to the health of the live stock of the state.

The persons composing the faculty of the state veterinary school, though not connected with the executive service of the state, being in reality paid by the state, must be considered as servants of the state; hence in a broad sense state officials. As has been said, these men must be the most competent the world can afford us.

As they are already paid by the state their constituting said "Advisory Veterinary Council" does not increase the expenses of the state.

They should be consulted upon all matters connected with the health and protection of the live stock of the state, and be the highest technical authority in the state upon these questions.

Their decision as to the nature of a given disease, in cases of doubt, should be made final by law. The school must also constitute the state laboratory for the investigation of all things connected with the prosperity and protection of the live stock of the state.

In case of any outbreak of disease among the live stock of the state requiring investigation, the appropriate instructors, or a competent assistant, should be detailed for the purpose.

It is very necessary to the perfection of such a school that each instructor have one or more competent assistants, but nowhere so necessary as in the pathological department, which has to do entirely with investigations into the true nature of the diseases and their causes; investigations of the most immediate value to state preventative medicine.

When thus ordered into the country to make investigations such persons should be reimbursed for their absolute traveling expenses, in so far as they were not covered by free railroad passes. The place of the present sanitary live stock commission should be taken by an agricultural department which should include that of the animal industries of the state, its head being a secretary connected with the

department of state. This department should be supplied with the necessary room, appurtenances, and clerks. The duties of such a department, so far as they are connected with the live stock interests of the state, should be to gather statistics as to the losses among stock from diseases of every kind, storm, flood, and disaster; as to the influences of traffic and transport upon the extension of dangerous diseases; if foreign to this state and introduced by dealers or common carriers; where the animals introducing the disease came from; their number; where they were introduced; by whose negligence; where they went to; the number of animals infected by them; what has been done with the latter, dead or alive; loss to the state; when, how, and where the outbreak was stamped out. Such a department should also gather information as to the location of injurious or poisonous grasses, weeds, or herbage over the state and the effects of the same upon stock, and in necessary cases depute the school to make investigations into the nature of the same. It should also gather exact statistics as to the number of animals bred in the state, breed and kind; the influences of thoroughbred stock in improving the stock of the state in actual value; how much new stock is introduced annually; number and value; where it came from and where it went to, so that its future value to the state can be followed up; the number of dairies in the state; number of animals in them, breed and kind, yield of milk, butter, and cheese in quantity and value; conditions of animals in said dairies as to health; number and character of animals fed in the state for home consumption; number and character of animals slaughtered and packed in the state; number and character of animals fattened in the state, but exported on the hoof; number slaughtered and exported as unpacked carcasses or meat; the disinfection and cleansing of all animal conveyances, the property of common carriers.

Such a department can only give the state the means of acquiring an actual knowledge of the condition of its live stock. Only through such a department can legislators get any reliable data upon which to base wise legislation.

Compare the value of an annual report made under the auspices of such a department as has been suggested to you, and with due regard

to the detailed requirements, with the useless report that has been lately issued by our Sanitary Live Stock Commission, which is absolutely wanting in practical suggestions or any information which can be used for future legislation.

Only through such a department is it possible for the state authorities and people to come to any correct judgment of the efficiency of any veterinary police system that may be organized. Our work is simply to discuss principles and suggest methods.

THE PROPER VETERINARY POLICE ORGANIZATION FOR THE STATE OF NEBRASKA.

I believe in the utility and necessity of a state veterinarian being attached to the agricultural department of the state.

What has been said in the previous pages of this paper, shows that, to the proper service of the state, the person selected to fill such a position must possess professional and administrative abilities of the very highest order. In fact, such a man must be the professional equal of every instructor attached to the school. Like the director of the school, the state veterinarian must be so broadly educated as to be able to appreciate the true relation of every branch of veterinary medicine—scientific and practical to the purposes of the state.

He must be the chief, technical, executive officer of the state for everything connected with the protection of its live stock from the dangers of contagious diseases.

A competent state veterinarian, in the light of our present knowledge, must not only be well instructed in the practical principles of veterinary medicine, but infinitely more thoroughly in the principles and methods of preventative medicine and scientific investigation.

Any other man than that is useless to the state to-day.

As I have read these requirements, many of you may have thought that they were altogether too exacting. In drafting them, however, I have had constantly in mind the letter and spirit of your state law in this regard, and I beg to say to you that any less qualified man than I have depicted cannot fulfill the requirements of Section 3, and especially Section 4, which commences as follows:

"The state veterinarian shall make a continuous scientific study of all diseases of animals and the causes," etc. You see the law is absolute, it says "shall make," and that means shall be competent to make, etc. Only by taking the course (or a similar one to that) herein recommended in the selection of men, and by the co-operation of a state veterinary school, can the spirit of the above law be carried out to the letter.

The manner in which state veterinarians have been appointed up to this time has been erroneous and utterly without any proper guarantee of their technical qualifications.

The state must supply itself with a trustworthy means of ascertaining this fact in the future. It is as follows:

There should be a public notification, in the chief veterinary journals of the world, that six months from a given date there will be held at Lincoln, Neb., a public competition for the position of state veterinarian; stating salary and conditions.

The conditions should be as follows:

The board of state examiners in such cases should consist of the secretary of state (or his technical representative, the secretary of the department of agriculture), the dean of the industrial college of the university, and a person nominated for the purpose by the officers of the state board of agriculture; these persons should act as censors only. The professional examination of the candidates should take place before this board of censors, and be conducted by such persons, or person as they might select from the veterinary faculty of the university, the examiners or examiner to have no vote upon the question of the candidates' competency, though the board of censors should be empowered to ask them or him any question they please in case of doubt. Any member of the board of censors should have the liberty of asking questions during the examination which bore directly upon the subject a candidate was being questioned upon.

Such an examination should consist of oral questions upon the veterinary police laws and regulations of the world with reference to any of the scheduled contagious or infectious diseases; questions as to the nature of their causes; how they become extended; what animals are susceptible to infection, and which not; the nature of specific causes, bacteria, where known; how they develop; how they are dif-

ferentiated by microscopical and biological methods; the natural telluric and climatic or other conditions favoring and opposing their development; their deportment toward germicides; the practical methods of disinfection and their value; the best means to the differential diagnosis of doubtful cases with the practical demonstration of the candidate's competency to perform the same. An examination in the methods of laboratorial experimentation in the laboratory of the state veterinary school. The regular performance of a forensic autopsy, with a methodic report of the results of the same, in writing; upon which the candidate should be questioned by the examiner.

Each candidate for the position of state veterinarian should also be required to present a thesis upon some one contagious or infectious disease, the same to be notified in the public announcement of the competition.

The respective candidates should hand their theses to the board of censors before the day of examination. When the first part of the examination has been completed to the satisfaction of the board of censors, the candidates that have been successful so far should read their respective theses and be obliged to defend before the faculty of the state veterinary school. Any member of the board of censors or faculty, or any other candidate, should be privileged to ask the reader of the thesis any question they desire connected with the subject treated. It is very essential to a correct censorship that each candidate write upon the same subject.

The students of the school, if established, should in future years be present during this part of the examination.

The successful candidate should then be informed of his appointment. The position of state veterinarian should be made a fixture, to be held during competency and faithful performance of the duties of the office. The salary should not be less than \$4,000 per year. Any veterinarian capable of passing such an examination as the above—and none other is suited to the position of state veterinarian—could not afford to accept such a position for any less. Such a man could soon make much more money in practice. No such man should ever be induced to accept the position for any less salary, and if liable to lose

it upon any change in politics or the opposition of factions in the legislature.

The obligations of friendship, relationship, or, in fact, any whatsoever, have no place where the best service of the state is concerned.

They could not possibly have any effect under the above-mentioned competitive system.

Such a competitive examination is the only practical method of insuring to the live stock interests of the state a competent state veterinarian.

You will be told that no man can be found that would force such an examination.

Make the salary correspond to the abilities demanded, and the position permanent, under the above mentioned conditions; give six months' notice of the competition; do not limit it to citizens of the United States, but remember it is simply the best service of the state that is desired, and the state of Nebraska will find material enough to select from. There is an American now in Europe, with over five years active veterinary police experience, that can fill the bill and hold his own against most men. The aim and purpose of a code of veterinary police laws for the protection of the live stock of Nebraska from the danger of contagious and infectious disease must be:

1. To concentrate the controlling force all possible.
2. To extend the executive responsibility for the existence and suppression of such diseases as much as possible among the local authorities of the state.

In other words, the stimulus to the exact execution of these laws, and the power to watch over their general and special execution, should be centered in the secretary of the department of agriculture and state veterinarian. The former should be the ranking officer. The direct execution of such laws should be left to the respective local authorities over the state. These laws and regulations should be so drafted that each owner of live stock, or his representative, should be held personally responsible to the state for the existence of any scheduled contagious or infectious disease among his own animals, by the state demanding the immediate notification to the proper local authorities, or the central authority, of the appearance of any suspicious symptoms in said

stock, under the penalty that upon the neglect of said notification on the part of said owner, or his representative, that all claims for any remuneration on account of any action of said local or central authorities shall be forfeited by such owner or owners should a disease of this character be discovered in any live stock and said notification not have been made. Such a notification must always be in writing. A similar notification to the local or central authority should also be made obligatory by law on the part of veterinarians, cow doctors, horse doctors, or in fact any person called in to attend, or any person who takes upon himself to attend, the diseases of any sick animals, under penalty of fine or imprisonment, or both, according to the gravity of the offense, the nature of which should be fixed by law according to the dangerous character of the various contagious and infectious diseases.

Ignorance of the character of the symptoms should never be accepted as an excuse in cases where the safety of such an interest as the live stock is concerned.

THE DIVISION OF THE STATE INTO VETERINARY POLICE DISTRICTS.

The state should be divided at present into such a number of veterinary police districts, according to their respective population in live stock, as will insure the proper protection and guarding of said stock from the danger of contagious and infectious diseases, at present say eight or ten. These districts should be made smaller and smaller as they augment in animal population.

The county, city, town, and village authorities should in such districts constitute the respective local authorities, upon whom the responsibility for the proper execution of the laws and regulations for the suppression and prevention of contagious and infectious animal diseases should depend.

At present each of these districts should have one district veterinarian of guaranteed ability; said competency to be warranted, by public competition, before the aforementioned board of censors and examiners.

Such district veterinarians should not be the executors of the laws, except in such cases where the emergency demanded that the laws of

the state be put into immediate action, before the proper local authorities could be notified. The district veterinarian should in such a case notify the owner of such animals, in writing, of the nature of the disease in question and of the reason for his action. A similar notice, in writing, should also be at once sent to the proper local authorities. At all other times the duty of such district veterinarians should be to fix the nature of the disease and act as technical advisers to the respective local authorities.

The respective local authorities and district veterinarians should be obliged to keep an exact statistic and account of all cases in which they were obliged to act; they should note the nature of the disease in each case, the number of animals and kind afflicted; their age, color, and sex; how long sick; where the disease came from; what was done; how long it lasted; number that died, or were killed, etc. The district veterinarian should also be obliged to note the daily conditions of the weather at his place of residence; the condition of the crops; the nature of the soil with regard to humidity; in fact everything bearing upon the health of the animals in their respective districts, so far as they could gain such information upon their daily rounds over the country. The agricultural department should supply the necessary systematically tabulated record books for such purposes.

The respective local authorities and district veterinarians should return quarterly reports of their actions and observations to the central authority. The sum and substance of such reports should be issued in an annual report by the agricultural department.

The money now used in paying the salaries and expenses of an unnecessary commission should be employed in paying salaries to such district veterinarians. The latter should be allowed traveling expenses, in so far as they were not covered by railroad passes. The charging of traveling expenses when a government veterinarian held such a pass should at once be followed by the forfeiture of his position and the loss of all salary due him.

The agricultural department should fix the limits of these veterinary police districts, and the place of residence of the district veterinarians. The latter should be allowed to practice their profession. As some parts of the state are not yet thickly settled, the veterinary police dis-

tricts in such would have to be larger and the opportunities to practice less than in smaller and more densely populated districts. The government veterinarians in these larger districts should receive a correspondingly larger salary than those in the smaller ones.

The present need of such district veterinarians can be well filled by the issue of a public announcement of a public competition for the same in the manner aforementioned.

The qualifications demanded should be regulated by the present standard of veterinary education in the best American veterinary schools, but only for veterinarians to meet such necessities as arise before they can be met by graduates from the state veterinary school of Nebraska.

The position of district veterinarian should also be permanent. Forfeiture of the same should only be dependent upon incompetency or neglect of duty. In case of such, the people should be instructed to lay their complaints, in writing, before the proper local authorities, who should carefully investigate the same, and if substantiated, place the full details of the case, in writing, before the central authority. The secretary of the agricultural department should then summon the delinquent district veterinarian to appear before a judiciary committee, consisting of himself, the state veterinarian, and director of the state veterinary school. The nature of the complaint and the testimony offered should then be placed before said delinquent, and a chance for defense given him. If his assertions and evidence are such to warrant it, he should be allowed time to summon witnesses to his defense; otherwise the decision of said committee should be final. According to the gravity of the offense the punishment should be either a reprimand or dismissal from the service of the state with the forfeiture of all back pay.

The agricultural department should be authorized to offer a reward of \$100 for the best series of quarterly reports returned each year by such district veterinarians.

With such a veterinary police system once organized, the state veterinarian should in future years be selected by public competition on the part of the district or county veterinarians of the state in the same manner as before, in case of a vacancy occurring.

Such a system will only serve to keep up the competency and trustworthiness of the entire organization. Such an organization will give to Nebraska the fullest possible protection of her live stock from dangerous diseases ; and would also be of great service to the owners of such stock, by the state aiding to meet their needs , by supplying them with competent and trustworthy veterinarians, which they very much need at the present time.

As the state increases in population—animal as well as human—and the demand for more government veterinarians increases, the places should be filled from among the graduates of the state veterinary school, after they had first graduated with distinction and then been in practice and won an honorable reputation for a period not less than three years (in case of necessity this last and the following conditions would have to be overlooked), and finally returned to the school and taken special instruction with regard to the nature of contagious and infectious diseases (which should consist largely in experimentation and laboratory work) and have passed a special examination and received a certificate of their competency for such work.

In such cases, as well as for the regular certificate of graduation, the faculty of the school should constitute the examining board—though I will casually mention that in my plan for the examination for the regular certificate of the state I shall recommend the appointing of a board of examining overseers of three members by the state board of agriculture. As scientific investigation never stands still, and as our knowledge of diseases is continually augmenting, the law should provide that all government veterinarians should be permitted vacations from their official duties at appropriate intervals, during which their salaries should continue, and they should be ordered to attend the school and hear the lectures and work in the laboratory in the courses for veterinary police diseases, that is of preventive medicine. At such times the state should fill such places with local veterinarians, who should receive remuneration for their services.

ONE WORD AS TO THE NECESSARY VETERINARY POLICE LAWS FOR THE STATE.

They should not be general—as now—but special and adapted to the peculiar character of each especial contagious or infectious disease.

They should consist of the most explicit instructions as to the duties and responsibilities of the central and local authorities, government veterinarians, veterinary practitioners, irregular practitioners of every variety, owners or their representatives, dealers, drovers, and common carriers.

The translation of the laws and regulations of the German Empire can well be used as a model and foundation upon which to build a code for Nebraska.

THE ESTABLISHMENT OF A VETERINARY SCHOOL IN CONNECTION WITH THE UNIVERSITY OF NEBRASKA.

Before entering directly upon the discussion of this question I wish to say a few words about

A STATE UNIVERSITY—WHAT IT SHOULD BE, AND ITS MANAGEMENT.

At the outset I desire to have it implicitly understood that my remarks are not directed at the University of Nebraska, or its management.

We are here to discuss principles only.

The first idea which is necessary for you to impress upon your minds is:

That a university is not a college, but is rather a collection of such colleges or special schools united together under a common general management, in that the general work of the university (and for us we have only to consider a state university) shall be guided in one general direction; that is, to produce the greatest amount of benefit possible to the state.

The various schools or colleges which go to make up such a state university are: the literary school; the various scientific schools, which have been in this country more or less united under the general name of the "industrial college," but which as they increase in importance will have to again become independent schools or colleges; the medical and veterinary schools, which in future years will again have to become united in a general way under the name of the school or college of comparative medicine. This generalization must naturally be limited to the strictly scientific branches of investigation and instruction.

From the practical point of view the two medical schools of a state university must be held distinctly apart, each having its independent hospitals and clinical instructors. Then there are the schools of art, astronomy, etc., etc., which we do not need consider now.

The fact that a university is not a college, and that its management must be general with regard to the whole, and independent and special with regard to each individual school or college, has never been sufficiently appreciated in the United States where the management of state universities has been concerned. The general management of a state university should be conducted by its board of regents or trustees and their executive representative, its president. Such management must only be of a business and general administrative nature they simply to see that the whole complexity of the educational (and investigating) machine works together in one direction, viz., the good of the state.

Herein lies the danger to the best success of our state universities.

The example of our endowed colleges has had the influence of tending to make the presidents of our state universities desire to do too much, the president of each special thing, to the neglect of the broader and more necessary work.

The president of a state university should have no voice whatever in the special technical management of the independent schools or college.

The regents and president have to indicate the general duties of such schools, but the direction must be left to other faculties.

If the latter direct wrongly, or insufficiently, then the regents and president come in as the regulating power appointed by the state.

A state university should be a truly democratic institution. It is an institution established by the state, for the good of the state, and to be conducted in that direction by the state.

In other words a state university is a small republic, with its general or central government, composed of its independent or individual states (schools), each with their individual governments.

The duty of the regents and president of a state university is to equalize the balance of direction (not power) between the different schools. Too much school rights, like too much state rights, would

be liable to be followed by the outbreak of some unpleasant pest, though it might not be dangerous to the live stock of the state.

A state university is, in a small way, what the united government should be, but is not "a government of the people, for the people, by the people."

The regents and president of a state university are responsible to the people (state) only for the quality of the work done, and not to the students directly.

Such responsibility demands unusually broad educational and great business, executive, and statesman-like abilities, for every educational necessity of the state must be seen, appreciated, and met in a manner to give the utmost practical results to the state.

No one power can do more than outline and direct such an immense task in a general manner.

The regents and president are like the general of an army and his staff, though the order of precedence seems to have been reversed.

The heads of the different schools are like the commanders of the independent divisions, the heads of the different educational departments like the commanders of regiments, the assistant instructors are the sub-officers. The students are the soldiers. The work of the whole is to overcome ignorance that the state may advance and prosper.

The president as the executive head lays out the work of the whole; the directors of the schools lay out their proportionate part, and detail to each instructor or investigator his special part, who is again responsible to the whole, and the state as well, that the work is well done. It is the duty of the regents and president to see that each individual part fits appropriately into its proper place and works in unison with the balance of the machine, in order that the demands of the state are fully complied with. This division of responsibility and labor is absolutely essential to the successful action of the whole. It extends to each individual instructor or investigator. Herein a state university is vastly different from a college, or even an endowed university. The latter is a place for instruction only, and is more or less limited by the ability of those desiring it to pay for it. A state university, on the contrary, being a creation of the people, by the people,

it is democratic, that is, for all the people who desire instruction. It must be free. As it is of the people, by the people, for the benefit of the people, it must be a place for the study and investigation of everything in the state having any relation to the welfare of the people; hence, a state university must be a place of original investigation, and for original investigators to work in, supplied with all laboratory and experimental conveniences, in order that the natural and artificial resources of the state may find the fullest protection, as well as all possible increase, through the discoveries of such men.

An endowed college or university can never to eternity, no matter how rich in funds, meet these demands of the state to any such extent as a state university must, to be true to its purposes.

The individual faculties, individual instructors, and investigators in a state university have a far greater and different responsibility than the instructors or faculties in endowed institutions like Harvard or Yale.

Their responsibility to the university as such is general, to the state special and direct, to the students individually indirect, and direct only as they represent individual factors in the prosperity of the state.

The state only is the judge that must be satisfied with the work done. The good of the state demands quality rather than quantity. When quantity exercises a debilitating effect upon quality, the latter must be augmented, no matter at what cost to quantity.

This is the all important principle which state legislators, regents, presidents, heads of faculties, individual instructors, and even students have got to have constantly in mind, if they would make a state university successful.

The people have learned this fact already!

The one question the people ask of a state university is, "What is it doing?" not "How much is it doing?" They criticise its work by the quality of the individual graduates—their own sons, or those with whom they are acquainted.

Momentarily they may ask, "How many students has such a university?" But this question is simply inspired by their interest in knowing "how much the university is doing."

The decisive question with the people will always be, with regard to such graduates, "How much do they know?"

No man can get away from this argument!

It is the only question by which the farmers of Nebraska will test the state veterinary school. They will only casually ask "How many students has it?" but they will constantly demand "How much do they know?"

The individual instructor in a state university must be a free man. A man of far more original ability than is required in an endowed one. He must be allowed the freest action in criticising the work and management of the university in relation to its usefulness to the state. Actions that would be considered as insubordination in an endowed college on the part of an instructor need not be such in a state university.

The regents are responsible to the state for the selection of the best qualified instructors and investigators, but the latter are equally responsible to the state individually for the quality of the work done.

The people will judge of their quality by the work done. It has been a matter of the most interesting self-study why I should have always had an innate dislike to endowed educational institutions. I could not tell why once, but I can remember disliking them even when a boy.

Now I know why.

Because they can never serve the full demands of the state. Because they are and must be exclusive at their very best. Notwithstanding the number of free scholarships they may have, their general usefulness will be always limited by the ability to pay.

I believe in the exclusive right of an aristocracy of educated brains, and equally despise one of money only.

An aristocracy of money alone is a complete sham. In so far as the money question comes into that of the demands for higher university education, over and above the actual living expenses of the students, such a university becomes exclusive to the public, it becomes more or less an aristocratic institution, its usefulness to the state is limited to a clique, only a limited portion of the population of the state are open to its benefits.

It is un-American ! It is aristocratic instead of democratic ! It is not of the people, by the people, for the people, in any true sense ! Harvard is most emphatically such an institution !

Witness the medical school of Harvard college, where these undesirable characteristics are most markedly displayed.

To become an instructor there three qualifications are absolutely essential and all others of secondary importance.

1. How and where were you born ? (Are you a descendant of one of its founders, or in any way connected with them ?)

2. How much money have you ? (Have you enough to move in the "cultured circles" of Boston ?)

3. Are you inclined to be unrespectably original ? (In other words you must follow in the ruts of respectable and conservative do-nothingism.

Harvard medical school is not of Massachusetts. It is conducted by a clique of Boston physicians, for their own self-admiration and individual benefit. Its influences upon the scientific advancement of the world, as a school have been "nil." It has been most terribly injurious to the advancement of medicine in the state. It ignores all medical graduates except those of Harvard. Its wealthy graduates go to Europe, because it's fashionable. They come home to admire themselves and be admired by their peculiar clique, of which Boston is full.

Such is Harvard medical school, and of such is the nature of Harvard college. It has not the nature of an educational heaven by any means. The poor student's ambitions and aspirations are crushed and smothered by Boston cliques and the oppressiveness of money. Try as he may he does not feel himself a man all over, unless of a peculiar nature which is rare. Harvard is essentially a Boston and Cambridge institution. It is not of Massachusetts. The real people take little or no interest in her. They are not of her. She is not of them. She asks nothing of them. Though the most persistent beggar in the United States, with her hungry maw always open to swallow inheritances, and utterly regardless of the rights of others, still she never goes to the people. She goes to the rich. She is of the rich and well-to-do. She

caters only to those who can help support her individually, never to the people as such.

Compare your own university with a thing like that.

Young and infantile as she is, she is of the people, by the people, for the people. Grand in her magnificent purposes, the free creation of a free people, her progress must be as free and untrammelled as the winds which course over your boundless prairies. She is of the people and by the people that have made her, not only for their own children, but also for any children of our common country who may desire to taste, and taste fully, of the fruits of the tree of knowledge.

A state university must be aggressive and progressive, in order to meet the demands of the state. An endowed university can never be, its only purpose being to conserve to the demands of its students.

A state university is free to select ability wherever it can be found.

An endowed university must consider the friends of its founders and benefactors. It dare not seek ability at their expense. It soon becomes more or less nepotistic, and more and more a family affair as it increases in years. It is a prolific institution! Its grandchildren become many, and must be honored and taken care of irrespective of the good of the state.

A state university being of the people is always open to the freest criticism.

An endowed one is not of the people and says to them, "Hands off," and still more derisively, "Tongues off." The chief purpose of Harvard is to give "culture" to gentlemen.

The only purpose of a state university is to educate and drill men so that they become of use to the state.

An endowed university must offer inducements for and to students, because their fees are necessary to its existence. The quality of the education is fixed by the demands of the students, not the necessities of the state.

The contrary is the case in a state university.

Legislators should not lose sight of this fact.

A state university is not dependent upon student's fees for its support. The number of students attending a state university has no relation to its prosperity, only in so far as they indicate the desire for ad-

vanced education, which the state inaugurates for its own self-protection and advancement. Were numbers taken into consideration in considering the usefulness of a state university, it could only lead to lowering the standard of education and injury to the state.

Having briefly considered the relations of a state university to the state, we have now to take into consideration that of a

STATE VETERINARY SCHOOL TO A STATE UNIVERSITY AND THE STATE.

In the preceding pages we have already marked out the work of a state veterinary school as follows:

1. To be the central technical authority upon which the state should depend for advice upon all questions connected with the prosperity of its live stock interests.

2. To be the central technical authority upon all questions relating to the connection between animal diseases or animal products and the public health.

3. To be the center of investigation into all questions connected with either of the above conditions: That is to be the center for the advancement of preventive and practical knowledge by means of original investigation.

4. To be the center of instruction by which the state may be supplied with scientifically qualified veterinary police officials, and the live stock owners with scientifically and practically qualified veterinarians, the quality to be guaranteed by the state. Farmers of Nebraska, this is what you have demanded of the state. This is what the state requires to meet the necessities of its live stock interests.

The fault will be yours only, if these demands are not met.

You have already done the whole country an invaluable service in making these demands.

You have already created the impression in the minds of the regents of your university that you do not demand a veterinary school, because such an institution can give to your sons a means of livelihood; but you have had the unprecedented foresight and wisdom to recognize the true relation which such a school should bear to the state, viz.:

That its only purpose should be to work in the public service of the state.

That is, to educate men scientifically qualified to take part in this service as original investigators and government veterinarians, and also men of equal scientific and practical qualifications to serve as an auxiliary force, and thus support the preventive work at the same time, and also serve you as competitive professional servants and advisers.

Your one demand has been, and must always be, quality, quality, quality. This fact you must impress upon the minds of all persons in any way connected with this venture.

If quality fails in the first graduates from such a school, the public will soon find it out. Public confidence will soon be lost. It will take years of hard work to regain it. The usefulness of the school will be nipped in the bud.

It may continue to exist. With public confidence lost it could only exist to the injury of its own graduates—to the injury of the wholestate.

Hence your responsibility; my responsibility as your chosen technical adviser upon these questions. Hence the responsibility of the board of regents and the legislators of Nebraska.

The work you have demanded of me this evening is terrible in its manifold responsibilities. Some people think competent veterinarians can be made in twelve months. They can not be made at all. They must be first born, and then drilled and educated. It has taken twelve years of uninterrupted labor and thought to enable me to prepare this essay for you. It has taken days and days of hard thought and study to make me competent to do it, even since I came to Nebraska.

You have the golden opportunity! As things now look, the future prosperity of the live stock interests of our country will more largely depend upon the example which Nebraska now sets than upon any other factor.

Such a school as you have demanded will of necessity attract only the ablest young men in the country.

Nebraska will have the first right and opportunity of selection.

She wants only the best.

Nebraska will set the standard as to what a qualified veterinarian must be for the whole country.

She will do more.

She will show her sister states what such a complete veterinary organization can do for its great live stock interests.

Gentlemen, do you realize the terrible importance of your undertaking? Do you realize that its ultimate completion means the forging of the key of salvation for \$2,500,000,000 worth of capital invested in live stock?

You are simply asking your government to do exactly what the European governments have been and are still doing for their people.

You, and you only, have risen above these people or any others.

What those governments have already done you have demanded of yours, aye more, your demand for the best absolutely requires the most earnest study of all they have done, but also demands that we, your servants, profit by it and improve upon it.

This is the work you have cut out for your legislators, the regents of your university, and the faculty of your veterinary school.

Aggressive investigation. Hard thought. Progressive advancement.

These three, they sum it up.

Our motto must be that of gallant Col. Crockett, of Texas:

"Be sure you're right, then go ahead."

But, "the consequences," say some timid ones.

Never mind the consequences.

"Do right" and leave "consequences" to take care of themselves.

"Consequences" always suffer badly, in the long run, where doing right is concerned.

It has been said that the management of the different schools or colleges of a state university must be left to their immediate faculties in all professional matters.

This is, perhaps, nowhere else so necessary as in regard to a veterinary school. No other branch of education requires more specific, scientific, and practical adaptation to its manifold demands than does the directorship of a school which has so many responsibilities as a veterinary school. Such a person requires an education of the broadest character. He, as well as every member of the faculty of such school, must know the past and present with regard to the manifold relation of the veterinary profession to the state, the nature of which has already been de-

picted to you. They must be equal to directing the present so that it shall not only equal, but anticipate the demands of the immediate future. They must be unceasing workers, indefatigable students, and the profoundest and most logical thinkers. They must be practical men, as you understand the term, and the most exact scientists at the same time.

They must be statesmen in the largest sense, scientists in the most exact sense, and practical men in every sense, if you would have the school meet all your demands.

In founding a state university all cannot be done at once.

The first thing necessary is the literary department, in order that the general standard of education may be elevated in the state.

After that comes the question:

What special school is next demanded by the necessities of the state?

The possession of eighty million dollars' worth of live stock demanding protection from disease, answers that question. It is

A VETERINARY SCHOOL.

"Be sure you're right, then go ahead."

Are you sure of that?

Then, farmers of Nebraska, "go ahead."

But "go ahead" slowly, but surely. Lay your foundation right, build solidly upon the only solid ground—the scientific. Complete what you have begun before undertaking another task. Let the regents see to it that this school is in complete running order, so that the state can know what its annual requirements are to be, before another school is undertaken.

Then, and only then, should they ask themselves, "What next?"

With that "next" they should proceed in the same manner.

By following this course, the citizens of Nebraska can and will have a university second to none.

Here a little, there a little; here a school with one teacher, and there one with another, may, indeed, catch a student or two more, but it is on the "pull, Poll, I pulled last" principle; the load of ignorance can never be moved that way.

The only way to conduct a state university is "a strong pull, a long

pull, and a pull altogether" in one direction, until a needed work is completed. Then, and only then, try another in the same way. This is the only spirit in which the legislature and board of regents should act would they make the state university of practical benefit to the state.

One word more and I am done with this part of the subject.

In the early part of this essay you were told that the key to solving the problem of the ultimate prevention of hog cholera was already in our hands, though in a roughly forged condition.

This work should not be allowed to stand still. To the complete finishing of the key so as to close the lock completely to this dreaded foe to your prosperity, it is necessary that an almost incredible amount of detail work is done. To this end the university needs a suitable experiment station and better laboratory conveniences, and money enough to carry on best experiments on a very large scale at once. I believe I can truly say to you that the work would have been in a practical shape to have been given over to the state as a reliable vaccine, had we had these things during the past year.

The regents of the university have provided for the expenses of this work so far as their means will allow, but as the whole state is to be directly benefited, and as it bears directly upon the preservation of your live stock from diseases, it should be evident that if the university pays the workers and supplies the buildings and means to work with, so far as laboratory conveniences are concerned, that the state should supply the means for animal experiments and their care, from other funds. For this purpose at least \$1,000 a year will be necessary. It will be found to be the best investment ever made by the state. It must be also borne in mind that such experimental studies will also extend to any other diseases that may break out or require investigating.

We also have the germ of the peculiar outbreak among cattle at Crete, which if not rabies, was an altogether unknown disease. We could do nothing with it, because, if rabies (?), we should have been obliged to test it upon dogs, which requires strong iron cages, so that there can be no possible danger to the public.

We also have a germ which is very fatal to mice and rabbits, which was procured from material said to have come from a case of Texas

fever. As young cattle are necessary to test that question with, we have been unable to do anything therewith, for the want of means also.

With regard to this work I will not say much as to what has been done, but I must say, and I say it with the deepest feelings of gratitude to you, farmers of Nebraska, that no living man ever had better opportunities to do an almost unprecedented amount of most valuable original work than your state has afforded me during the past six months. This I owe mainly to you; for to you is my call here due. Had we not commenced this work a little in advance of the time that your university could command the necessary funds and conveniences to do it with, there would have been something completed that would have stirred the country from East to West.

It shall be yet !

STUDENTS.

The subject we have been discussing would still be left incomplete did we not say a few words about students.

In this regard, then, a few principles which must be adhered to if the school would be a success :

1. The quality of the work done in it must be its only public announcement. Students must seek the school, not the school the students.
2. Students must be taught that the purpose of the school is to educate them for the public service as a part of the army to fight disease.
3. They must learn that they are simply so much raw material and the school the refinery.
4. It is the sole duty of the school to cull out all unsuitable material and to only give such the "school brand" as can be guaranteed to be of the "Simon-pure quality."
5. Every student must be fitted to lead a "forlorn hope" against death, or he is not to be graduated.

Enough has been said in the foregoing pages to show you that to begin the study of veterinary medicine and produce qualified veterinarians, young men of no common abilities are an absolute necessity. They must also possess a natural adaptation to veterinary medicine, or all the schools in the world cannot make qualified men out of them.

The prevailing idea in human medical schools, in America, seems to be that anything can make a doctor.

We see some queer things doctors.

Now, experience has shown you that "anything" cannot make a reliable veterinarian.

Young men who to-day would be accepted into the medical department of your university, aye, more, young men who are graduates of it, would be by no means suitably fitted to enter upon the study of veterinary medicine in such a school as you have demanded.

You have said that what Nebraska requires to meet the necessities of her live stock interests is quality, not quantity.

In order that this factor of quality be absolutely guaranteed to you, it is necessary that the university or faculty of your veterinary college have some reliable means of discovering where it lies and how much there is of it, before your young men are permitted to enter upon the study of veterinary medicine.

This must be!

It would be unjust to would-be students not to make such a selection as much as possible beforehand, because were it not, so many unsuitable men would then be permitted to waste four years in useless study, with the moral certainty of failing to graduate. A state school must be just to students and more than just to the state.

Hence, I very much desire that you will not only insist most strongly upon this item of quality, but place your views so emphatically before the regents of your university that this quality must be discovered before the students enter the veterinary school.

There is but one practical way, and that is: That none but graduates of the industrial college of the university, or their equivalent, be accepted as students in the veterinary school.

This measure has two practical phases of equal value to the state and even the university.

It will increase the attendance in and quality of the industrial college, and guarantee that of the veterinary school.

It will excite public confidence in the veterinary school at once.

"It is business."

Students from other states desiring to enter the veterinary school

must pass the same examination as those of Nebraska by the faculty of the industrial college. This measure will naturally limit the number of students in the veterinary school, but not below the present demands of the state.

It will insure your demand.

Quality first; quality last; quality everywhere.

The course of study in the veterinary school must extend over four full years to insure the state this quality.

I have only one word more to say.

This whole work is your work. You began it and you must see it through. You should appoint a very active and influential committee to take charge of this veterinary school question in the legislature and to support your own demand, made through the regents of your university.

Gentlemen, I am done. I have endeavored to be your honest servant in the past, to do my level best for the live stock interest of Nebraska. I promise you to do my utmost in the future utterly regardless of myself, with all the devotion a mind filled only with scientific enthusiasm and the desire to serve one's race can.

Gentlemen, I thank you.

ADDRESS OF HON L. S. COFFIN.

DELIVERED BEFORE THE STATE CREAMERY CONVENTION, AT FREMONT,
NEBRASKA, 1886.

I am glad to be able to meet with your association in its first annual meeting. I was in at its birth, and I stand as a sort of godfather to it, if you know how much that means. Webster, I think, says this godfather makes himself a surety that the child will forsake the devil and all his works.

If I am to be godfather to this association in that sense, it may give me the right to take a fatherly oversight of it, and give it, on proper occasions, some wholesome advice. Solomon says "Train up a child in the way he should go, so when he is old he need not depart therefrom." If this be true, too, then in order to save myself trouble in my sponsorship over this yearling just celebrating its first anniversary, perhaps I had better begin to-night, and give such words of counsel and advice as the time and the circumstance might indicate.

Mr. President, I may mean far more by the words "the time and the circumstance" than the common or casual hearer might think, and the fullness of their meaning may develop farther along in the paper.

This child is born in "perilous times." It is to meet with terrible temptations right at the threshold of its existence. When its elder sisters, born in Iowa, Illinois, Wisconsin, and Minnesota, first saw the light, very different skies hung over their advent into life than what looks down upon this latest born of the dairymaids of the great West. To them everybody held out open arms, and farmers' families all over the land—those who intelligently understood the meaning of such advents—shouted aloud for joy.

The consumers of dairy products also sang like the morning stars of old, they sent up the wild chorus over the new-born world. Not so now—your birth comes in under lowering skies, instead of clap-

ping of hands and wild, thrilling songs of joy—dark forebodings, lurking suspicions. The day comes in without the bright morning star of hope—the black pall of discouragement spreads out over every farm and dairy household.

When your elder sisters were born there was sure and good profit in the cow. She was the animal with the golden hoof. Every man that kept ten cows on his farm knew that these ten would buy him, from the proceeds of their milk alone, ten more by another year. He knew he could double his working capital each year. The poor, indebted, and mortgage-ridden grain raiser saw the way out of the clutches of the money loaning fiend. He could get a few cows and in a short time their milk would float his debt. This is all, or to a very great extent, entirely changed now.

The man with cows and dairy fixtures has had his income cut right in two by the middle. Men are wanting to sell and but few wishing to buy dairy cows. In all the years of farm industry up to the present time men have been wont to look upon the dairy as something sure. Sometimes, and under some circumstances, the income may have been slow, still it was one of the sure things. In the last decade nothing has paid the Western farmer better. Since skill, intelligence, and money have all lent them aid in developing the dairy interest to a wonderful degree, private dairies and association creamery and cheese factories have sprung up as by magic all over the West, where a short time ago it was thought nothing but grain raising could exist.

Now creameries are closing up, private dairies are curtailing their work, and general depression and discouragement sit brooding in homes where a short time ago all was hope and cheerful expectation. Bad times these, for the dairymaid of what is to be one of the grandest states in the nation to be ushered into life.

Those who have attended these meetings understand full well what I mean, when I thus refer to the perils to which the young life of the fair daughter of your state is to be exposed. I may be allowed for the sake of those present now, who have not been able to attend the other meetings, to state briefly the situation.

I would do this for another reason. Should the finances of your

a sociation allow of printing the proceedings and papers of these meetings, I want to place before that larger audience who may read these reports the real facts, in order to awaken all to a proper sense of the need of urgent and united action upon this important point.

Strange and even paradoxical as it may seem, while the world generally is growing better, while our civilization is constantly rising higher and higher, and there are more good men and women on the earth to-day than at any time in the history of our race, here are, at the same time, the most gigantic swindles, and the most unblushing swindlers, carrying their dark and selfish schemes to an extent never before known or dreamed of.

This is an age of money making. There is a craze to amass vast sums; to accomplish this, some men stop at nothing. No scheme is too vile. No plan that may involve in its execution the utter ruin of others is objected to on that account, provided it brings the dollars.

Acquisitiveness is all right in its place. It is indeed the imperative duty of every one to acquire a sufficient amount to make himself and family independent of want—yes, to be in affluent circumstances even.

It is right and proper for some to acquire largely more than the comfort of himself and those dependent upon him demand, that he may use it for the good of his race, in founding and building up institutions for the uplifting of manhood.

But this insane rush to amass millions for the name of it or for the sordid pleasure of having it, is so small and mean that I have hard work to have any respect at all for such miserly souls. You know how the New England Yankee is naturally educated to save every cent, and to hold on to every quarter till the imaged eagle would scream from the squeezing grip.

This kind of an early education I had. "To be sure and get the best end of a trade" was the gospel with the average Yankee; economy of the most rigid stamp was a necessity. This was all right if it went no further. But alas! for poor human nature; when it was so hard to earn a dollar honestly among the rocks of New Hampshire, it was a sore temptation to give a "leetle" better character to the cow or the horse we were selling, if by so doing we could get a dollar or

two more for the animal than it was actually worth. Yes, it was something to be proud of, and I was so taught by the example of some of those around me, that to be sharp and get the best in a bargain was a sign of smartness and an omen of good for the future.

Such an one they would say is "bound to get ahead." "He will be rich," and to be rich was the *magnum bonum* of all good. When I came West and commenced life as a man for myself, there was something about these broad, free prairies that somehow made me ashamed of my little, narrow penurious Yankee ways and longed for a wider manhood.

It took me years to conquer myself—years before I could look on the other man's side, who was either buying of or selling to me. Now I would not exchange the satisfaction I have in being able to say to a man, "That animal you don't want, because of this or that defect." If I can better a man or his finances by a trade with him, then I trade.

It has now become so that it is hard for me to conceive how a man can coolly and deliberately go to work to deceive another in order to take from him some money he could not otherwise do. I can't understand of what stuff such men are made.

Such men I fear. If a man will deceive me so as to take from me money without returning an equivalent, would he not, if he could do it, and steer clear of the law, waylay and rob me? Now, applying these thoughts and principles, let us go on with the thought this seeming diversion led from.

We will return to it by a roundabout way.

With what high hopes, with what visions of good have the farmers, the dairymen, and creamery men started out in this promising state! A great many have made the mistake here, as in Iowa—that of sticking too long to grain raising. But consider for a moment the great number in the aggregate scattered throughout this entire state who own cows and depend more or less on the cream and butter they expect to sell to get many of the thousand and one things with which home is made up. How many here, learning how well dairymen have done in Iowa, have, with great effort and sacrifice, provided themselves with a few cows to go into dairying. How many have planned to seed down their land, so as to have tame meadows and

pastures for their cows. How many energetic, enterprising men have put their money into creameries and have induced the farmers around them to buy cows, with the expectation of selling cream.

I wish it possible I could get at the entire number in your state who are this very night prepared, or are preparing, to so shape their affairs that their future income is to be more or less affected by the price of butter. I wish it were possible that I could arrange them in marching order and lead the long procession by this audience, so you could count them. Oh, what an army would file past you, Mr. President! How we should become interested in the various families and individuals as they passed by! This family was sure that their ten cows would, in a year or two, pay off the mortgage on the homestead; that one was expecting to make enough this year so that Sarah, the oldest girl, could be sent to the high school next year. See that widow with those five children—the oldest boy is a cripple for life, but what a head and eye. The mother is saying to herself, I can get enough for the cream from my eight cows that I shall sell to the creamery to put my boy under the tuition of such a teacher, and if so I am sure he will make his mark in the world, even if he is lame. We could sit for hours as the long train of hopeful families passed by. It would indeed be a long train, thousands on thousands, so many that the morning light would find us still here, waiting for the rear of the column to pass.

Who can measure the high hopes, the many expectations? How full our own hearts would be, who have been in any way instrumental in shaping those hopes and reasonable expectations!

I say reasonable; who ever heard of a failure when calculations were based on the cow? Good butter has always, since the world began, brought cash, and who expects to make other than good butter now the creameries have come and taught us all so much? Then, if we are so situated we cannot make good butter at home, the creameries will buy our cream, and give us as much for the cream that will make a pound of butter as we usually get for the butter after we have put our time and work in to make it. Of course there is good money in dairying here, where land is so cheap and feed so plenty.

If dairying pays away back in New York and the New England

states, where land is worth \$75 an acre, hay \$20 a ton, and corn gets to a dollar a bushel, why, it is as clear as sunlight we can make it pay and pay big here, for it costs but a trifle more, if any, for us to send our butter to New York or Boston than from farms in those states. So the happy and expectant families reason, and with full faith they go on with perfecting their plans for creameries and for private dairies.

I said I wish I could tell the number of the individuals in your state whose future is to be affected more or less by the price of the butter they expect to sell.

I wish I could arrive at something of an estimate of the amount of butter all these hopeful people would make in a year.

It would be millions on millions of pounds. Wouldn't it?

In Iowa we estimate we have sold in some years as high as \$50,-000,000 worth of dairy products. I see no reason why Nebraska can not in the near future expect to equal us in dairy matters.

As it is even now, the amount you can produce this coming year is enormous, and the amount of money you expect, or have reason to expect, to receive is so large that it is difficult for the mind to completely grasp it. Certainly none of us can reach out and take into adequate comprehension all the good the money it should bring would carry to the numberless families and individuals.

Now, I am most reluctantly compelled to turn another side of this picture to the audience. I have struggled and labored to bring to your minds some idea of the vast number of pounds of your dairy and creamery butter possible to be made for sale in your state this coming year. Please keep that undefined, indefinite, vast amount in your minds.

Vast as that amount is, there is one man in Chicago who can make and send out from his factory and put upon the market more pounds of what is sold as choice creamery or first-class dairy butter than all the butter-makers and creameries in this great state of yours, and that man will not have a cow to his name for the purpose.

This is not all. That man can undersell you till he reduces your price below the cost of production even here, where land is cheap and feed so low as to command almost no price at all.

The mere statement of this fact is so appalling in its far-reaching consequence that it is with the utmost difficulty I can command my emotions so as to intelligently make it. It is terrible truth for me to stand up here and utter; so astounding is this fact that its realization nearly paralyzes the entire dairy people of this nation, and well it may.

Do you ask what is the stuff made of? I can't tell. Some say tallow and leaf lard, together with a small per cent of butter, are the main ingredients. But it matters not what it is made of.

No one asks what a counterfeit bill is made of, or what kind of ink is used to print it. It is enough that it is counterfeit. That condemns it. This bogus butter is a counterfeit. That is enough. It is never sold to the consumer under its real name. Consumers are interested in this thing as well as the makers of the real article. Mark the point I am now about to make: Mr. Armour, one of the largest manufacturers of this stuff, a very rich man, claims that he makes his out of clean, pure tallow and leaf lard, some chemicals, and with a certain per cent of butter. He claims that his product is wholesome and no one can tell it from genuine cow butter. Admit it for the moment, it is a fact that tallow and lard can be deodorized so that neither can be detected by the smell.

It is also a fact, now mark, that tallow and lard from diseased cattle and cholera hogs can also be deodorized so that it cannot be told from that of the healthy or recently killed animals.

Now if Mr. Armour, professing to be honorable and making only from pure tallow and lard, but allows it to be sold, not for what it really is, but as pure butter, will not some other man, in order to make money, buy up cheap, impure, and cholera hog lard, put it through the same process and make an imitation of Mr. Armour's butterine and sell it for his, and it go on the market as butter also? Here is where the thing leads, and there is no safety if we once consent to the fraud in any way or shape. There is no escaping the conclusion, hence I say the consumer is vitally interested as well as we producers.

It would be useless for me to state in numbers the millions of pounds of the fraud stuff that are made each year now. It is enough

to say, as I have, that one man has in Chicago an establishment of a capacity to make more pounds than all the private dairies and creameries in Nebraska put together, and there are at least fourteen factories in Chicago alone. How many there are at other cattle and hog slaughtering points the Lord only knows ; I don't.

I have said I could not conceive of what material a man could be made who could deliberately go to work for the sake of the dollars and cents and rob thousands on thousands of hard-working, honest people, as Mr. Armour and those engaged in a like work are robbing them.

If there was left any manhood in them, I would like to have them come and sit down by your side, Mr. President, while I would again order a countermarch of the vast army we have had pass in review before us this evening ; yes, I would like for that man Armour to sit here and look these people in the face as they come marching back, with a full, realizing sense of all his work meant to them. I would have him understand how these people had come mostly empty-handed into this new country, how they had endured all the privations of pioneer life, had lived in cabins and dugouts, had contended with drought, and grasshoppers, and cyclones, had struggled manfully with debts, had lived on corn-bread and potatoes and salt until they had begun to see daylight ahead ; had, as I have said, collected a few cows around them, and were just building hopes of schooling their children, mortgages lifted, the old claim cabin exchanged for a comfortable farm-house ; were, in fact, just beginning to feel that they were men and women. Over again, I say, I would like for them to look into this man's soul, if he has one, as he reads in the faces of all these people, as they pass slowly by, how hope had fled, how the bright visions of an hour ago had fled. Could he look that crippled boy in the face ? Could he meet the fiery indignation of that mother's eye when he knew he had taken from her the last prop, the only hope for that darling, first born, crippled boy ?

If he had the least particle of the soul of a true man he would need no other hell than to be obliged to sit there and look on the people his greed had ruined.

Well, here we are confronted with these monstrous facts. The next

thing comes the pertinent question, "What are we going to do about it?"

Shall we tamely bow down and take upon our necks the yoke? Shall we sit still and let one man's interests outweigh the interests of ten thousand men, women, and children, who personally are a thousand times his superior morally? No, I trust, yea, no! A thousand times no!

The American-born man and woman will submit to no such robbery and imposition. A counterfeiter is a counterfeiter the world over. We, the people, rule here in America. If we have no law now on our statute books that can reach these scoundrels, we can mighty quick put some there.

If the men we have already elected to make for us suitable laws to protect the interests of the people do not do it, we can put others in their places so quick that it will make them think that a cyclone is about. Let every man, woman, or child who can write sit down at once and write to their member of congress, and give him to understand that this thing must stop or his head comes off at once.

These butter fraud chaps may have the money, but we, the people, have the votes.

Money goes a good ways with a congressman, I know, but votes go further.

It is the "dear people" they will be most anxious to please, therefore, I repeat it, sit down and write at once; this week, next week, and the next, and so on every week. Let them understand up at Washington you mean business, and they will do it.

All we ask is a law that shall compel them to sell the "fraud" as a "fraud."

Put a revenue officer after them, let there be a weigher in every slush factory, and let him put a revenue stamp on every package, large or small, that will stay there until the last ounce is sold to the consumer, or Uncle Sam will ask why. State laws they will manage some way to evade, but when Uncle Samuel gets after them they are terribly afraid, for his big cowhides come down with the weight of a ton on the toes of those who presume on his ignorance or verdancy.

Yes, we must all, everybody, arouse and let these fellows who are

robbing us and imposing their vile compounds on the people know that this great country is not quite ready to go to the dogs just that a score of swindlers might get the earth.

Why, I had it on my tongue to say the other day, while in Chicago, that the women's broom brigade of Iowa would march down to the city and sweep every last brick of the cursed factories into the lake and the men that run them with them, and they will do it, too, before they will submit to such robbery.

I don't know when to stop, Mr. President, when I get upon this subject. I don't see how any man can hold his peace. "Cry aloud and spare not" is the great command sent forth by the pressing wants and wrongs of an outraged people.

We who are more interested in the production of dairy goods are not the only ones interested. What man or woman is to be found who is sunken so low but who has some desire to know what it is they eat, especially when it is so important an article of diet as butter?

I have already said that the most objectionable and offensive fats can be put through a process of deodorizing so that they cannot be distinguished from clean, healthy lard and tallow, of which these compounds imitating butter can be made, but because it looks like butter do you want to eat it?

Already many patents have been issued from the patent office for the making of this stuff. Here are some of them:

WHAT IS IT?

The patents for counterfeit butter which were named in Commissioner Colman's paper, read before the national butter, cheese, and egg convention, involve the use, among other things, of the following named ingredients: Sour milk, all kinds of animal fats, lactic acid, peanut oil, almond oil, olive oil, soda ash, salt, stearine, orris root, leaf lard, treated with a solution of nitric acid and borax, milk, sugar, bicarbonate of soda, butyric acid, beef suet, glycerine, coloring matter, buttermilk, tallow, pepsin, saltpeter, boracic acid, benzoic acid, ground slippery elm bark, salicylic acid, caustic soda, corn starch, cooked farinaceous flour, annatto, benne oil, prepared cow's udder, sal soda,

oil of sesame, oil of sunflower seed, vaseline, etc. Who cannot relish bogus butter after this?

No, we producers are not alone in the work of dealing with the "fraud." All will help. All we ask is that it shall go upon the market under its own name. As it is now, it has stolen the livery of heaven to serve the devil in. It has stolen our tubs, all our choice packages, and it has stolen, too, all the dear, sweet, pet names we have invented with which to call our dear, pure, rich, and aromatic products of our best dairies and creameries.

Here are some of them:

Spring Rock Creamery, Maple Grove Dairy, Cloverdale Dairy, Jersey Isle Herd Butter, Cream Foam Dairy, Iowa's Best Creamery

When asked why they steal these names, they reply: "Oh, we don't believe that creamery and dairymen have got a monopoly of the English language."

We have all heard much about the cheek of the government mule, but, Mr. President, ladies, and gentlemen, hereafter it will only be an insult to that long-abused animal and to the father of all mules to mention a bogus butter man's name the same day with that of a jackass or his offspring, the mule.

Cheek! Cheek! I have seen pretty hard things in my life, living as I have part of it in the granite state, but I take my hat right off, at once, and vote a medal to a butterine man for hardness of cheek. I would give it to him for hardness of heart, but I find on careful post mortem examination he has none.

Leaving this part of my subject I come now to the fatherly advice part of my work. The godfather becomes a surety that his foster child will forsake and eschew all the ways of the devil. You may do this. I mean this state dairyman's association, and it may not be hard for you to do this. When Webster defined a godfather the bogus butter devil was not known. Evolution had not gone far enough then to make his birth possible. He is on earth now. He goes up and down the land not seeking whom he may devour, but goes doing it. The men, women and children who are his natural prey are so many and so thick he does not need to hunt. They are on every hand and he is devouring them.

The question is, will you kill this devil or help him? As a god-father I offer myself as surety that you will forever forsake his ways.

Now I am going to ask you as a state association, just entering upon what can be a path of great usefulness, this pertinent question: Will you keep wholly and perfectly aloof from the way of the meanest of all devils, this butter fraud man? I mean a good deal by this question.

Some years ago when the butter and cheese association was held in Cedar Rapids of our state, I was asked to prepare a paper and read there. I did so. That paper was a plea as strong as I could make it, that Iowa creamery men would forever stand aloof from mixing anything with their butter. I wanted that the word "Iowa" on any dairy product from our state should be an open voucher for its purity.

I had dropped on to perhaps the first one, and up to that time the only one, of our many creameries in the state which had just begun to use neutral oil. I don't know as any do it now. I don't want to believe that we have a creamery in the state that does it.

The oleo oil makers in Chicago say that many of the creameries of the country buy their neutral oil to mix with and cheapen their output.

This may be a false accusation from a set of counterfeitters and frauds to turn the storm of scorn and condemnation they see coming upon their own swindling pates. It would be no more than natural to expect from such a set of swindlers, but supposing that every creamery man and every dairyman in our state had, from that date, so set his face against this fraud, so that there was a moral certainty that all Iowa products were the true article? It would have been millions to-day in our hands.

Let this association take high grounds on this matter, expel and put the mark of Cain on every man that may join your association who, I was about to say, was even suspected of using a pound of neutral oil, but certainly every one who uses it. Let it be the laudable and bounden duty as well as ambition to have all of the dairy product from your great, grand state true to name. Have it so that the word "Nebraska" shall be a warrant to the genuineness of your goods, so much so that it will tempt others in other states to steal your good name.

Do this and then shall I indeed be proud to stand sponsor for this fair, young, and latest born dairymaid of this great West.

A grand career is open to you for great usefulness. Lest some may be discouraged by what I have said in this address, and be deterred from entering into the dairy industry, let me say be not so alarmed. So great is the crime against an industry in which so many are interested, an industry of the farm, which can employ all the members of a farmer's family better than any other; an industry that has, since we were people, been one of the most reliable if not the most remunerative; an industry that has invested in the cows alone more money than in all the nation put together, and one, too, that will be protected; so great is the wrong sought to be perpetrated that its very magnitude and heinousness will work its own cure.

The people are being aroused, and we shall see a wave of frenzy so sweep over the land like one of our tornadoes, carrying destruction to all engaged in this work, the equal of which the devil himself had never dreamed. Take then not one step backward. Sell not a cow. Let him that hath none sell a reaper or a horse, and buy one. This land will and must be a land of milk and butter, if not flowing with milk and honey.

God makes no mistakes. Such a state as this, such a soil for grasses, such streams and springs of water were not made without a design. The time is coming, and that not far away, when the population upon the square mile of this land will be a marvel. In the economy of a densely populated rural district the cow must and will figure as one of the chief economic forces.

Let, then, no one be for a moment disheartened. As sure as grass grows and water runs dairying is to be one of the most pleasant, sure, profitable, and important industries of your state. It is the industry for the masses of farmers. It is one of the certain roads to independence. It leads to intelligence and refinement. No swindler like Armour or any of his clan can thwart the ways of good in the heart of God to his children. Do well your part, lift high the standard of excellence and purity of all your dairy products, and you are sure to win.

This agitation about this fraud is going to disgust people more and

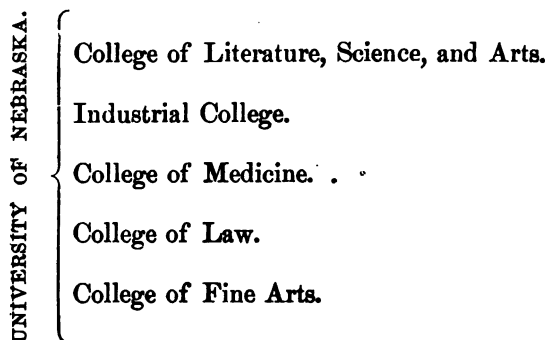
more with the miserable imitations, and create a larger demand for the genuine article.

It is in fact to be one of the best really in the end that could happen to the dairy interest. The true bill becomes all the more precious because of the many counterfeits.

THE RESOURCES OF THE UNIVERSITY OF NEBRASKA.

BY CHARLES E. BESSEY.

The University of Nebraska is by the law of the state made to include five colleges, each of which has its special purpose and its independent courses of study. No one college is the university, and no college has more right to the use of the word university than any other. The word university is used collectively, and includes all the colleges. This may be made plainer by a diagram as follows:



Much confusion has arisen in the minds of some people as to the legal relations of these several colleges to one another, and to the university as a whole. This has doubtless been due to the fact that until recently all the work has been carried on in one building, and the popular mind, not having brick and mortar aids, has failed to see several colleges. This is not to be wondered at, for few people yet realize that a college is its men and students, with more or less of books and apparatus, and that a building is but the *home* of the college

—not the college itself. As the university grows older its several colleges will have their separate buildings for special work; but for many years yet there will have to be much of common use of all buildings and facilities. Let not these conditions cause us to lose sight of the fact that the several colleges have an existence, and that they are doing their distinctive work just as certainly as if such work were done in separate buildings. When every college has its building or group of buildings, it will be an easy matter to distinguish one college from another, and to understand the relation of the colleges to the university.

When the state founded the university it was located in Lincoln upon a campus of four blocks, and a single building was erected for its use. Two of the colleges were opened, viz., the college of literature, science and arts, and the industrial college, and in this one building all, or nearly all, of their work was done for many years.

Upon the admission of Nebraska into the Union in 1867, the general government gave to the new state seventy-two sections of land for the endowment of a state university. These lands, amounting to 46,080 acres, were all located within the state, and by the constitutional provision relating to all educational lands, cannot be sold at less than seven dollars per acre. The minimum value of this endowment is therefore \$322,560.

By an amendment to the act of congress passed in 1862, the state was entitled upon its admission to thirty thousand acres of the public land for educational purposes, for each senator and representative which it had in congress. The proceeds of the sale of the lands so given by the general government are required to be invested in safe stocks yielding an interest not less than five per cent per annum, and this interest, in the words of the law, "shall be inviolably appropriated by each state to the endowment, support, and maintenance of at least one college, where the leading object shall be, without excluding other scientific and classical studies, and including military tactics, to teach such branches of learning as are related to agriculture and the mechanic arts, in such manner as the legislatures of the states may respectively prescribe, in order to promote the liberal and practical education of the industrial classes in the several pursuits and professions of life."

The college thus endowed was the industrial college of the university. The 90,000 acres of public land were all selected within the state, and, as in the previous case, the minimum price is fixed at seven dollars per acre. The minimum value of this endowment is thus \$630,000. Now the relation of this endowment to the other funds of the university may be easily understood. Let it be remembered that the university is the aggregate of its colleges. It may have an endowment the income from which is thus a general fund, not for any particular college, but for all. Moreover, each college may have its individual endowment, the income of which is a special fund for its particular use. In the universities of the old world individual endowments of colleges are common, as are the individual endowments of certain departments or professorships in the older institutions of this country. Here, then, in the state university we have one of the colleges, the industrial, already provided with an endowment, as it is hoped all will be eventually.

The endowments described are from the national government, and from them the university has lately begun to realize an annual income which is slowly increasing. At present it is about as follows:

From the university endowment.....	\$11,000
From the industrial college endowment.....	23,000

To these funds the state has added an annual income, the present value of which is about \$53,000; making the total income of the university about \$87,000.

Turning now to the non-productive property of the university, we make the following estimates of its present value:

University campus, 4 blocks.....	\$ 95,000
Two brick buildings thereon.....	120,000
Library, museum, chem., physical, and botanical apparatus..	50,000
Experimental farm.....	160,000
Total.....	<u>\$425,000</u>

While these sums appear large, they are none too large for the highest educational institution of a growing state. Three of the col-

leges of the university have been opened to students, and the remaining two will soon demand recognition. Each of these must have its one or more buildings. Each must have its outfit of special apparatus and materials for work and investigation. Each must have its library; each its museum. The industrial college must have a full equipment for work in agriculture and the mechanic arts. There must be barns, stables, and enclosures for the study of the diseases of domestic animals. And finally, as the years go on, there must be a constantly increasing force of instructors to meet the demands made by the young men and women of the state who seek a higher education.

HOG CHOLERA.—CAUSE OF SWINE PLAGUE OTHER THAN SPECIFIC.

A CONSIDERATION OF ITS TRUE NATURE IN ORDER TO SHOW HOW IT MAY BE STAMPED OUT OF THE STATE BY REGULATIVE MEASURES. BY FRANK S. BILLINGS, D.V.M.

No disease that occurs in animal life has but one cause. This axiomatic fact applies equally as well to contagious and infectious diseases as to others. In order that we may be able to prevent a given disease it is absolutely necessary that we first arrive at correct conclusions as to its exact and true nature. Without this knowledge all attempts at its radical prevention will prove futile. A knowledge of the true nature of a contagious or infectious disease is of far more importance in considering means to prevent it than a knowledge of its specific cause. The same is also true as to the character of the secondary or supporting causes, without which the specific cause could not act.

Let us apply these principles to swine plague. In my communication upon the specific cause of this disease—the micro-organism—I took occasion to state the fact that it is an infectious, and not a con-

tagious disease, and that, in essence, it is a specific septicæmia of extra-organismal origin; that it is due to a specific micro-organismal element which finds its primary development and conditions for its vital support outside of the porcine organism.

I consider the establishment of the true nature of swine plague of infinitely more importance than the discovery of its specific cause, or even the discovery of a practicable means of prevention by an artificial vaccine. Up to this time all investigators in this country have pronounced swine plague to be a "contagious disease." This opinion is unequivocally wrong. Because it is wrong is the reason that all attempts at its prevention have so utterly failed.

Law says: "This disease may be defined as a specific contagious fever of swine." Report of department of agriculture, 1878, p. 379, Detmers says: "Swine plague is a disease *sui generis*; it is communicated to another by direct (contagion) and indirect infection." Ibid., p. 332. Salmon says: "This disease is contagious, and in a great majority of cases may be traced to contagion." Report 1880-81, p. 13. "The demonstration of the contagiousness of the disease has enabled our agriculturists to do something to prevent its spread. Our investigations have shown that the swine plague is a non-recurrent fever." Report 1883, p. 57.

As usual, Dr. Salmon is wrong both as to his conclusions and statements. I challenge him to produce evidence demonstrating one single fact that has yet been discovered by any previous investigators which has practically "enabled our agriculturists to do something (or anything) to prevent the spread" of swine plague.

Swine plague is not a "non-recurrent fever," hence "our (Salmon's) investigations have shown" nothing in this regard.

The assertion of Law and Salmon that swine plague is a "fever" shows a want of true pathological knowledge. Fever is a general phenomenon common to all irritative diseases, whether specific or not. Specific fevers do not occur; hence, while accompanied by fever, swine plague is not "a fever." Detmers is partially correct; for, by "indirect infection" he means infection pure and simple.

To the ordinary and non-technical reader this may appear very fine reasoning, but it is absolutely essential for the owners of swine to un-

derstand these points, would they be able to practically prevent swine plague. A contagious disease is an endogenous disease; that is a disease which invariably finds its primary origin in a specific element—also a micro-organism—which invariably finds its proto-development within the body of a given animal species. It is communicated directly from one animal to another of the same species. Syphilis, pleuro-pneumonia. On the other hand there are contagious diseases having a more extended dispersion over the animal kingdom, though they find their primary development in a given species, but can extend by contact, wound, infection, to some other species. To this class of contagious disease belong glanders, which finds its primary development in solipeds, but also accidentally, never primarily, may be extended to cats, dogs, guinea pigs, sheep, goats, man, and some other animals, but never to cattle. Rabies, small pox, foot and mouth disease of cattle are others. The distinguishing point between contagious diseases, and strictly infectious ones, aside from the direct passage of the disease from animal to animal, is, that though this specific cause may retain its vitality, under favorable conditions, for some time outside of the animal organism, still it does not continue its development there, nor does it infect any outside materials. It remains attached to such elements only! Its danger soon ceases. It loses its virulent capacity and vitality. The contagious element of glanders does not retain its vitality for over forty days, when found on the nasal discharge, or other effluvia from a glandered horse. Rinderpest does not hold over six weeks in a stable. To this fact is probably due our good fortune in not getting that plague among our cattle, rather than to any protective system that we have. With regard to the lung plague I cannot say how long the contagious elements will retain their vitality outside the bovine organism, but certainly not very long. It is singular that this pest should have engaged so much study but with the least scientific results of almost any contagious animal disease. Notwithstanding all it has injured this country, our government has never made any proper scientific investigations looking towards its prevention. The lung plague is positively and practically preventable by artificial inoculation with a vaccine. The Hatch experiment station bill will break the monopoly which Dr. Salmon has held over original investigations with re-

gard to our animal diseases, and we may soon hope to see a large number of independent workers in different parts of the country, each endeavoring to outdo the other, and acting as controlling agents over the work of one another.

To return to our subject :

It is a disgrace of the medical as an educated profession that so few of its members really have the faculty of logical and philosophical thinking. Medical technology and medical language are used utterly regardless of even the common decency of exactness.

Nowhere else is this fact more apparent than in the use of the words contagious and infectious. They are used unthinkingly and indiscriminately, one for the other and vice versa.

Infectious diseases, or exogenous diseases, are such in which the specific cause finds its source of primary or original development and support outside of the animal organism ; that is, in materials which offer the requisite chemical and physical conditions to support its vitality ; from such sources susceptible animal organisms become infected.

Infectious diseases must be divided into

Contagious proper,

Infectious (pure and simple), and

Malarial infectious.

This differentiation being decided by the peculiar deportment of the specific infecting element in each disease.

Swine plague is a disease of purely infectious character, as are also

Anthrax, Texas fever, yellow fever, Asiatic cholera, and other diseases ; that is, it is a disease in which the etiological or causing element finds its primary and original development outside of the porcine organism. These diseases are strictly organismal in this sense. The cause, which in all these cases is a micro-organism, though not at present positively known in every case, develops primarily in the earth, under certain exact conditions of that earth with regard to moisture, heat, and its chemical components. Hence it is that it is very essential to discover what these conditions really are, for by knowing them it may be possible to so change them, or to so avoid exposing animals to the influences of such localities, as to prevent an eruption of such diseases among them. This has been possible in anthrax and

should be with regard to the others. For an animal to become diseased with an infectious disease of this nature it is necessary for it to be in or upon an infected locality. By eating the grasses, breathing the air, or drinking the water, or even eating roots or herbage or grain grown on such a locality, the animal may become infected. Such diseases are strictly local in their primary origin.

Then comes a factor in connection with them which has led, and still leads, to a great deal of misunderstanding, but which it is most decidedly essential that we should come to some uniform conception about.

It has been said that animals become infected in or on such localities. The localities can be well called fixed or natural centers of infection. They bear a similar relation to truly infectious diseases as that of the living animal of a specific species does to a contagious disease; the latter are movable primary centers of infection while the former are fixed. In this case also the infected animals can and do become secondary centers of infection. That is, movable, living centers of infection. But in this regard, even, they act, as such, far differently than animals affected with a strictly contagious disease. They can infect other localities, and if the conditions are favorable the etiological movement again makes itself at home and retains its vitality, but what is more important and the essential point of difference between such diseases and strictly contagious ones is, that the specific cause can again proliferate if the conditions are favorable, and such centers can and do become tertiary centers of infection; while material dropped or taken from a contagious disease would soon lose its virulence under such circumstances. It can thus be seen that this class of diseases are generally much more difficult to prevent by hygienic restrictive measures than the purely contagious. In the latter, when we have killed or safely removed the diseased animal, and exposed the place where it was kept to the open air and taken some ordinary precautions, we have generally removed the danger, if we have acted with due regard to the nature of the disease; but in an infectious disease, every spot in which the animal has been and left its dropping, or where it has finally died, or been killed, may become a center of infection, and the earth from such places can be carried on men's

boots, or by animals, or in dry seasons get into the air by the transpiration from the ground and be wafted no one knows where. The difficulties of preventing swine plague are thus apparent, but they can be overcome. The fact that such infected animals can be the accidental means of an infectious disease of this character being transmitted by various ways to other susceptible animals has led many reputable observers to look upon them as contagious, which is not the case by any means. Admitted that flies can convey anthrax from an infected animal to another by first biting the sick one and then a well one, its proboscis being soiled with blood; admitted that an animal with wounds on its limbs, treading in the manure of a diseased one, can become infected with anthrax; admitted that a man with wounds on his hands can become infected from the blood or offal of such animals and die of malignant pustule, still that does not make any disease of this class contagious. Under proper conditions and with the necessary care on the part of attendants that none of the hay or utensils of any kind to which diseased animals have access can come in contact with the healthy ones, we can often limit any outbreak of anthrax to the originally diseased, though there may be many others in the same stable; they may breathe the same air, eat of food from the same mow, and drink from the same fountain, if the disease germs have not gained access to their body at the same time with the others we can prevent their becoming infected. In my article upon the "Etiological Movement in Swine Plague" attention was called to the views of Hueppe upon the German disease of the same name, and to his claiming its identity with a German disease called "wild seuche." I am surprised to see that Heuppe also falls into the error of being unable to differentiate between contagion and infection—with regard to genesis; in connection with the "wild seuche," he says:

"Experimentation has demonstrated that the natural eruption of the exanthematous form must be due to infection through accidental wounds in the skin of animals by the presence of the infecting organism in the earth, mud, water, or dust of their grazing places. It is a fact that this exanthematous or cutaneous form occurs as a purely contagious disease and is transmitted from animal to animal."

That is incorrect. There is no evidence that the disease in ques-

tion is a contagious disease, in the strict sense of the term, in any of the descriptions of its clinical course, while there is every evidence that it is a purely infectious disease. Its attacking a very large number of animals in the same herd at the same time does not make it a contagious disease, but rather points to the presence of a common cause and similar susceptible conditions in the animals (wounds, etc.), nor does it exclude the possibility of flies, etc., playing an active part in its extension, as in anthrax.

The disease discussed by Hueppe, is one bound on locality, and peculiar telluric and climatic conditions in said localities. It never develops primarily in an animal organism, but such animals become infected when in infected localities. This is certainly not the essential nature of a contagious disease, which is one in which the contagious or infecting principle, so far as we now know, invariably has its proto-origin in the organism of some given species of animal life, and never outside of it. Etiologically speaking a contagious disease is one in which the development of the infecting element is invariably intra-organismal and never extra-organismal; though it may retain its vitality, or perhaps proliferate under favorable conditions, outside of any animal organism, but it never originates there.

This "wild seuche," like anthrax and swine plague, is in reality an extra-organismal disease with regard to its etiology. That infected animals can and do offer a favorable locality for the intra-organismal development of the germs, or that by means of some object, such as flies, or their offal, they can and do cause other animals to become infected, does not constitute such diseases contagious. Animals with no abrasions, with every possibility avoided of the conveyance of the disease from a diseased one by flies, insects, etc., can stand side by side in the same stable with diseased ones and breathe the same air and have very much contact, with due precaution as to feed troughs, water buckets, etc., on the part of the attendants, and never be exposed to the least danger of infection.

Susceptible animals cannot do this in glanders, pleuro-pneumonia, rinderpest, and such diseases; nor would healthy dogs be endangered, under due precaution, were any number of rabid dogs caged in a kennel so that they could not possibly come in contact with them.

Hueppe again says:

"The exanthematous form is by no means so frequent, under natural conditions, as the pectoral, and the pathological phenomena go to show that the disease should be generally designated as an '*infectious pneumonia*.'"

Here Hueppe contradicts his previous assertion that the disease is "contagious." While everybody knows that all contagious diseases must of necessity be due to an infecting principle, yet no one would dare claim that peculiar clinical forms of one and the same disease, due to one and the same cause, can be infectious in the one case and contagious in the other, as Hueppe does in this case.

Something more than natural susceptibility and cohabitation is necessary to infection in strictly infectious diseases; that something is generally accidental inoculation.

The animals simply play the part of local conveyers or centers, offering favorable conditions for the intra-organismal development of the etiological movement, which never originates primarily in them.

Take for example Texas fever, one of the most striking of all infectious diseases, and one which deports itself in the exact manner of its twin sister, the yellow fever.

A herd of Texans (infected on their native plains in the usual mild manner) are driven north. People do not notice any strikingly ill phenomena about them. They lay over in B's pasture. The next day in C's, and so on. Some weeks may pass by and B and C put their domestic cattle in the same pastures that the Texans were in. Their cattle die. Previously they were in the adjoining pastures; they may have smelt of and licked some of the Texans; the direction of the winds may have been such that they breathed air more or less polluted by the Texans, but they remained well; but the minute they went on to the pastures the Texans had grazed over they became infected with the Texas fever and began to die.

The Texas cattle, in themselves, were not dangerous to B's and C's cattle, but they had that in their droppings which found favorable conditions in the earth for its life and development, and this earth, these pastures, the roadsides where such Texans have been, thus became infected centers of danger to northern cattle, though the Texans

might be driven in this way from Texas to Chicago, and not one of them die.

Take anthrax in the same way. Anthrax is, according to our present knowledge, the most dangerous though not the most extended of all these infectious diseases. By dangerous I do not mean in the damage it really does, but according to the tenacity of life of its germ in a spore condition. These spores possess a degree of vital energy against the extremes of cold and heat that is not excelled by any known living object. During my visit to Sioux City in the summer of 1886, I took pains to examine the fresh manure from a diseased cow that had been some time exposed to the air, which was offered the favorable temperature for the development of spores. I found the spores developing most plentifully. Now each one of such deposits could cause the infection of the earth underneath them, or be broken up and dispensed over the ground. Such spots can be a center of infection the next summer.

No material from any known contagious disease has this degree of extra-organismal vitality, or this quality of extra-organismal development.

In the face of such undeniable facts with regard to anthrax, one is surprised as well as honestly indignant to see a member of his profession occupying the high and responsible position of state veterinarian displaying the most unpardonable ignorance with regard to the nature and causes of anthrax, and advising the farmers of Nebraska to put anthrax diseased cattle into fresh pastures, thus really giving the very best advice possible to cause increased outbreaks of the disease the coming summer.

Such advice demands the most absolute contradiction by every friend of the cattlemen of Nebraska.

The passage may be found in Dr. Gerth's report of what the sanitary live stock commission and state veterinarian of Nebraska have not done, as well as what they should not have done, and is as follows:

"Anthrax (*Charbon Miltbrand*).—This is a germ disease. The germ is known as 'bacillus anthracis.' Five mild outbreaks of this disease came under our notice. The number of deaths in each outbreak being small. The owners were advised to change pasture, feed,

and water, and keep them on a laxative diet for a few days. The result from such change was most beneficial. No further deaths occurring." *Sic!*

Now a word as to malarial infections as distinguished from strictly infectious diseases. Like the latter they are strictly local diseases, but unlike the latter they remain so. An organism to become infected must live in or go to such infected localities; it can itself become infected; it can leave such localities and go to others, but it does not become a secondary means of infection; it cannot infect those localities, nor can other organisms become infected from it. The most striking example of a disease of this character is fever and ague. A person afflicted with it may go elsewhere and have it; he can sleep with people that have never had it, but they will remain well. He neither infects other localities, nor can other people become infected from him.

Swine plague is an infectious and not a contagious disease.

Both contagious and infectious diseases have other causes than the one specific or exciting cause, the "cause sufficiens," the "iniciens" proper, as it is technically called.

The most singular of these causes, and the one in general most difficult to combat, as well as the one etiological movement about which we know nothing as to its real value, and probably never shall, is the racial or species cause, or that peculiar, unknown factor or condition in certain species of animals, which, of itself, predisposes the individuals of a given species or race to certain diseases to which other species have no susceptibility; for instance, the human race has its measles, mumps, scarlet syphilis, yellow fever, cholera, etc.; the equine species its glanders; the bovine, pleuro-pneumonia, rinderpest, etc.; the canine and feline, rabies; the ovine, its peculiar variola, or pox, and the porcine its swine plague. While, as previously mentioned, quite a number of entirely different species may have more or less of this peculiar racial predisposition to either a contagious or infectious disease that occurs primarily in one species, there are other diseases of the same nature that find this natural predisposition in only one species. So far as we now know swine plague is an example of the latter class as well as the lung plague of cattle. Man seems to have this

natural predisposition to more specific diseases than any other species of animal life. Why, no man knows. It certainly is not because

"In Adam's fall
We sinned all,"

as ancient theologians once tried to convince the world. No sensible man believes that "rot" nowadays. We know absolutely nothing of the nature of this racial predisposition, still, it is owing to our empirical knowledge that it really exists that we endeavor to combat it by means of the artificial inoculation of the individuals of a susceptible species with a modified virus prepared from the malignant specific cause of a given disease.

I will not touch upon this side of the question further at present.

The combating of contagious diseases is frequently a very simple affair in comparison to those of a strictly infectious nature, we stop all contact between diseased and exposed and healthy individuals, kill off the diseased—if animals, stop traffic in them for a time, and disinfect the stables, and that is the end of it, hard as it seems to do it in this country.

In infectious diseases that have become extended in various localities over a wide area of territory, the case is quite different. We have to find some means of rendering the infected localities, the water-courses leading from them, innocuous; in many cases even the air is impregnated with the malignant death producing germs.

Hence, it is no wonder that suffering humanity demands that science seek a speedy source of relief by means of an artificial vaccine. This method, while in some cases proved to be more or less practically possible, as in the case of anthrax (for sheep!), blackleg in cattle, and swine plague, will still be found a very cumbrous means of prevention, and in swine plague only possible of application at the expense of the state.

In some strictly contagious diseases the case is quite otherwise and a vaccine has proved a practicable and, in general, trustworthy means of prevention, as in small pox. It will finally be found to be the case in pleuro-pneumonia also.

I was surprised to hear that a veterinarian had lately been in Lincoln and been presented to the live stock committees of the legislature,

who told them "that in order to get rid of the swine plague it could only be done by killing off all diseased and exposed swine and placing a rigid quarantine on all importation for a period of sixty days."

If that report be true it simply shows that that veterinarian knew absolutely nothing about the nature of swine plague.

Were every hog in Nebraska killed and paid for by the authorities, were all importation stopped for a period of six months, and not a live hog left in the state, swine plague would again break out in newly introduced hogs, no matter how healthy at the time, in the course of a few months.

Why?

Because the disease is infectious and not contagious. Because no attention had been given to hog-pens, sheds, hog-runs, and the burial places where diseased hogs have been buried.

All this looks very discouraging at first sight, but as I shall endeavor to show the prevention of swine plague is not only possible, but not so difficult an undertaking, if the state authorities, railroad authorities, buyers, breeders, owners, and slaughterers will all unite as one determined force and take a vigorous pull, a long pull, and a pull altogether in this one direction, according to the instructions which will follow this paper Wednesday next.

To combat an enemy we must first know its nature and resources. When we become thoroughly acquainted with these factors we lose our fear of it. I can but think that the best part of our work upon swine plague has been that we have become acquainted with its true nature. We have found out where its inner "cussedness" lies. We were formerly in the position of the Irishman described in poetry by James Russell Lowell.

He went to Louisiana and squatted and built a hut. On coming home one day he found an unknown visitor had possession, the kind of which he had never seen. He looked at the "baste;" he thought of the green bogs of the "owld counthry," and like us he preferred to be with things he was well acquainted with and had no fear of, or as Lowell puts it, (I quote from memory) he says:

"I'll go home to the owld woman,
Its bether to die with a divil I knows
Than to live with a murtherin alligator."

We are in the condition of Lowell's Irishman—we know the “divil” we have to do with, and it shall not be my fault, but that of the farmers of Nebraska, if we do not gradually and securely draw out his fangs and render his poison impotent to work much evil.

The work of preventing infectious diseases, while different, and directed at different objects to a large extent, is still of much the same nature as that of preventing contagious diseases.

We must pay great attention to diseased animals, but not, as in contagious diseases, because they are the chief cause of extension by directly infecting other animals; but, because they can do far worse, they can infect any and every locality in which they come, and drop a malignant seed which may find suitable means of development in such localities, and hence give cause to the infection of new animals, of a susceptible species, that may come in contact with such localities, or material taken from them.

The preventive treatment of swine plague must, to be successful, then, be directed to these infected localities.

They are:

1. Sick swine and those that have been with them.
2. All places in which such swine have been—pens, runs, cars, or wagons.
3. Keeping off from such places all and everything that can carry any infectious material away and disperse it elsewhere.
4. The burial place of diseased swine.
5. Keeping sick swine or dead swine, or all drainage from hog runs or burial places from all and every contact with running streams.
6. Controlling importation.
7. Placarding every farm and place with “swine plague” signs where the disease exists.

This germ, which has been described in a previous paper, is the specific exciting cause of swine plague.

The conditions above tabulated are what are technically known as the supporting and extending causes of the disease.

Prevention will be most easily attained by giving our attention to these secondary or supporting causes.

Our chief endeavor must be to confine the exciting cause in the in-

fect localities, until it dies out, which event can be hastened by vigorously applied hygiene and preventive measures.

Out of numerous examples at command the following are appended as evidence that swine plague is an infectious and not contagious disease; others will be found in the regulations appended.

A Mr. —, in Valparaiso, Neb., put a lot of healthy shoats (which were carefully selected from farms in which he knew there had never been swine plague) into a run upon which there was an old stable, the bottom being covered with straw and refuse. A year previously a large number of hogs had died of swine plague in the same stable. Since then no hogs had been in the stable or lot. Twelve days after putting the shoats in the lot they commenced to be sick and many died. The specific cause had retained its vitality in the straw and dirt of the stable for nearly twelve months.

No contagious disease deports itself in that manner.

A Mr. N—, of Crete, Neb., had his thoroughbred hogs separated from his feeders by a wire fence with a twelve inch board at the bottom; they were on higher land, however. The feeders died rapidly of swine plague. The disease had been on the same run the previous year. The hogs on each side rubbed up against the boards and laid alongside of them and frequently smelt of one another.

The thoroughbred hogs remained well. Mr. N— remarked, "A fence will keep it off if one lot is on higher ground." They were watered from a well. That did not extend to his stock hogs. A contagious disease cannot be controlled so easily under such circumstances.

Mr. J. C. D., of Lincoln, writes: "I have to say that I am the only farmer that lost no hogs and had none sick in 1885-6—fully two-thirds of the hogs in this vicinity having died. My neighbors turned their sick hogs out and they were frequently around my pens, and twice broke into them, but I never lost one. I don't believe in medicine. Stevens creek runs through my farm, but I never let my hogs near it, but water them from a well. The plague appears on the creek first and spreads rapidly down it, appearing later on the highlands. Turning diseased hogs loose to die in the draws, to be

washed away, and dogs carrying the carrion about, contribute largely to spread the disease."

Contagious diseases are not spread by streams but by diseased animals directly. Detmers gives the following illustrating examples:

"Mr. Henry Yothy informed me that his next neighbor lost every hog but one on his place; while he (Yothy) had nineteen head of swine up in a yard and did not lose a single one, notwithstanding his neighbor's diseased animals had been running at large and tramped all around Yothy's pens and close to his fence every day, but as Yothy's hogs had no lesions or wounds whatever (?) and had remained separated from them by a fence, and had no opportunity to consume food or water soiled with excrements or urine of the latter, or to become infected in any way."

The next examples are especially suggestive as to some necessary preventive measures.

"Mr. F. has no near neighbors. Several streams have their origin on his farm, but only one has its source above and runs through it. He has always remained free from swine plague until last year, 1878. Three-quarters of a mile from his place, situated at the head of a ravine, which, however, does not extend through Mr. F.'s farm, is a rendering establishment, where dead hogs are rendered into grease and lard oil. The carcasses of dead hogs are cut up there, and pieces are frequently lying about on the ground, and these parts which do not contain any grease, or are worthless, such as the lungs and intestines, are thrown into the ravine, and are washed away by the water or remain where they are thrown until it rains. Further down this ravine unites with another and these two make a small creek which empties into the Mississippi. Every herd of swine that had access to that creek became affected and nearly every animal died."

Mr. H. makes the following statement:

"I have a farm on the banks of the Henderson river, and last year kept quite a herd of hogs. One morning I found, lodged at my hog lot, which joins the river, a dead hog which had come down stream. My hogs discovered it earlier than I and were feeding on the carcass when I came. Ten days later they commenced to die. Loss, \$1,500."

"Mr. L. reports that he had had no disease among his hogs since

1862, except two years ago when swine plague was communicated to his herd by a drove of hogs which came from an infected herd, and were permitted to stay over night in his hog lot."—Report Agricultural Department, 1879, p. 394.

The next communication will be my last upon swine plague, and will be a consideration of the regulative treatment of the disease in order to secure its prevention.

LINCOLN, January 31, 1887.

HOG CHOLERA.

To the Board of Regents and the Chancellor of the University :

GENTLEMEN—Herewith please find my second, and most important, announcement of the work done under your auspices. I think that you have no reason to be disappointed, as we only began working July last. While much remains to be done in a strictly scientific sense, we need to make but one large test experiment in order to turn the question of the prevention of swine plague by inoculation over to the state authorities. I will not attempt to thank you for the constant trust and support you have given me, as well as your co-laborers of the board of regents, because I cannot, but will rather endeavor to show my gratitude by future work.

Your obedient servant,

FRANK S. BILLINGS.

TABLE OF EXPERIMENTS.

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|--|--------------------|
| 1. Six months old hog sick with swine plague (recovered). | } Penned together. |
| 2. Six months old hog recovered from swine plague last winter (no effect). | |
| 3. Six months old hog sick with swine plague, died. | |
| 4. Six months old hog recovered from swine plague last winter, no effect. | |
| 5. Three months old hog in pen with No. 4 after 3 had died, no effect. | |

6. Three months old hog inoculated with culture from Mr. W.'s pig (of July 8, '86), July 20, '86, died July 25, '86.

7. Three months old hog inoculated with culture from Mr. W.'s pig (of July 8, '86), July 20, '86, died Aug. 1, '86.

8. Three months old hog inoculated with culture from Mr. W.'s pig (of July 8, '86), July 20, '86, died Aug. 7, '86.

9. Three months old hog inoculated with culture from Mr. W.'s pig (of July 8, '86), July 20, '86, recovered.

10. Same as No. 2 inoculated with culture from Mr. W.'s pig (of July 8, '86) July 20, '86, no effect of consequence.

11. Same as No. 4, inoculated with culture from Mr. W.'s pig (of July 8, '86), July 20, '86, no effect of consequence.

12. Same as No. 1, inoculated with culture from Mr. W.'s pig (of July 8, '86), July 20, '86, no effect of consequence.

13. Another pig, same lot as Nos. 2 and 4, inoculated with the same material; no effect of consequence.

14. Healthy pig inoculated with tenth generation of same material as 6 to 13, Sept. 28, died Oct. 13, '86.

15. Healthy pig inoculated with third generation of material from Rising, Neb., Sept. 28, died Oct. 7, '86.

16. Healthy pig inoculated with third generation of material from Rising, Neb., Sept. 28, recovered.

17. Healthy pig inoculated with third generation of material from Rising, Neb., Sept. 28, died Oct. 15.

18. Healthy pig inoculated with third generation of material from Rising, Neb., Sept. 28, died Oct. 16.

19. Healthy pig inoculated with third generation of material from Rising, Neb., Sept. 28, recovered.

20. Healthy pig feed with potato culture of same bacteria Oct. 23, no ill effect.

21. Healthy pig inoculated with three grammes bouillon culture from spleen of sick pig Oct. 27, died Nov. 17; lesions very marked.

22. Same as No. 2	} Inoculated with 5 fl. grammes of a pure bouillon culture from the Rising outbreak, which killed rabbits in four days. Some swelling and heat at point inoculated, and lameness. No other evil effect.
23. Same as No. 4	
24. Same as No. 13	
25. Same as No. 19	

26.	Healthy pigs six mos. old.	{	All raised at college farm from sows that had had the swine plague the previous winter and recovered. Each inoculated with three fluid grammes of a vaccine on the 14th of November, '86. Somewhat off feed for a few days. Heat and swelling at point inoculated. Again inoculated with the same material on November 27th, '86. Appetite not much affected. Some swelling and heat at points inoculated.
27.			
28.			
29.			
30.			
31.			
32.			

The above experiments show that the hogs which had the swine plague could not be re-infected by inoculation, nor by contact, nor by pen infection, as they were not only placed in the pens with sick hogs, but also in the same pens with the pigs killed by inoculation with pure virus.

The next question was to expose these hogs to natural infection in the most extreme manner possible. A most severe outbreak of swine plague at the farm of Mr. B., near Lincoln, offered not only a fitting opportunity, but the severe snowstorm of November 17, in which my test hogs were snowed in with a large number of sick and a dozen or more dead hogs, added to the severity of the test.

EXPERIMENT.

Five hogs that had had swine plague the previous winter at the college farm, four of which had been repeatedly tested as mentioned above, and one which had not been so tested, as well as Nos. 26 to 32 inclusive, and two non-treated pigs (test pigs), were sent to the place mentioned. Fourteen in all.

The results of this experiment were not as satisfactory as could be wished for various reasons.

First. The smaller pigs were rather fine quality, and four of them were either stolen or run over by the cars, which went close by the field where the sick drove was, and the wire fence did not keep the smaller ones in.

Second. The two test pigs and one vaccinated pig died of the swine plague or the storm, but had the lesions of swine plague; they were found covered with snow and frozen stiff, so that an autopsy

was only made at some inconvenience. Cultures grew from the spleen and mice succumbed to the cultures.

Two of the inoculated pigs, being small and somewhat weak, died the second day after their return to the college farm from the general exhaustion. No lesions of consequence; nor were bacteria to be found in them either by examination of their blood with the microscope, or by cultivations.

Fourth. The five hogs from the college farm that had the swine plague, and been already severely tested, as well as the one from the same lot that had not been so tested, went through this exposure to infection and storm without any visible effect, though exposed for twenty-three days, and have remained well ever since.

The result obtained then had only this value: It completely demonstrated that the majority of hogs that have been through swine plague from natural infection will not have the disease a second time, even after very severe tests, and therefore that

Prevention by vaccination is possible.

With regard to the two inoculated pigs that died from the effects of exposure, I will claim nothing, but will mention that the Hon. S. W. Burnham, senator from Lancaster, who so kindly placed the infected herd at my disposal to do anything I pleased with, remarked "that those small pigs will not live any way if severe winter comes on." I also vaccinated some forty of Mr. Burnham's hogs, and very severely; these hogs came through and have since thrived better than any other hogs on the place. Whether this fact was indeed due to the inoculation or not cannot be positively asserted, but there is a favorable suspicion that it was.

TEST EXPERIMENTS.

The next thing was to try the vaccine test over again. To this end fresh pigs, numbered with tags in their ears, were selected; their numbers were 41, 42, 43, 44, 45, 46, 47. Nos. 42, 43, 44, 45, 46, 47 were first inoculated with four fluid grammes—in the inside of the hind leg—of a mild vaccine upon November 4, 1886, and again with six fluid grammes of a stronger vaccine upon November 27. While thrown off their feed and somewhat lame, with some heat and swell-

ing on the inside of the hind leg, they did not seem to suffer very much. No. 41, which was the same pig as No. 20 in the previous list that had been fed with pure potato cultivations, was inoculated with the same amount of vaccine as the others (six fluid grammes), on the 27th of November.

December 27 Nos. 41 and 44 were inoculated with six fluid grammes of a fresh culture (second generation) made from the spleen of a hog from a very virulent outbreak at Valparaiso, Neb. These hogs were inoculated directly into the abdominal cavity. On the same day and at the same time Nos. 47 and 46 were inoculated with the same material, in the inside of the hind leg.

December 28 No. 41 died from the effects of the bacteria only, that is, of septicæmia, or blood poison, as can be seen from autopsy No. 1. Its blood and the tissues of the spleen were literally swarming with the well-known bacteria. Though frozen solid, cultivations grew from the spleen, and two rats inoculated with 1 c. c. m. of a bouillon cultivation from the same succumbed in forty-eight hours. Pure cultivations were obtained from the rat, and have since been re-tested and again proved fatal.

Nos. 44, 42, and 46 that had been vaccinated twice in thirty days were somewhat off their feed and lame a few days but entirely recovered, while 41, that was only inoculated once, succumbed.

On December 12 Nos. 45 and 47 were again inoculated with six fluid grammes of a bouillon culture that had previously been tested upon rats and proved fatal. These pigs also recovered completely and may be considered proof against swine plague.

We have therefore positively proved that we can prevent swine plague by inoculation of healthy swine with an artificially prepared virus.

We have now hogs 44, 42, and 46 that will, to a dead certainty, withstand all exposure to infection, if placed among sick hogs, as they were tested with a vaccine of unusual malignancy for this year's swine plague in the state.

The fact that No. 41 succumbed so quickly to the same virus though the liveliest pig in the lot, shows that one vaccination is not sufficient.

Nos. 45 and 47 will probably also withstand any natural test, as they have been inoculated three times.

No. 43 has been purposely left without the final test inoculation, but will, I think, stand it also. While there is an immense amount of detail work yet to be done, we have got to fix the exact amount of inoculation necessary, and the time which is necessary to elapse for the constitutionalization of the virus so that immunity can be produced. I hope to find some small animal so susceptible to the virus that by passing it through a short series of such animals it will attain a constancy of virulence capable of killing hogs in about five days, and have no doubt that it can be done as soon as we have means to experiment properly. This fact settled, we shall then have a simple and more practical way of obtaining material than by taking material from sick swine, where I find there is great variation in the natural virulence of the germs.

On account of having no place suitable to breed and keep small animals this winter I have been really unnecessarily retarded in my work, as I think had its value been truly appreciated such room could have been supplied me. As it is, I can but think the work done should satisfy every reasonable person of its quality, and my known skepticism should be a sure guarantee of the trustworthiness of the results. I am prepared to subject the above pigs to any test that may be suggested before a committee of farmers or members of the legislature, had we means to do it. All we now need is the means to make one grand test experiment, which I propose to do as soon as the funds you have so kindly asked for are at our disposal.

I shall then request a committee of the board of agriculture to watch the experiment, and shall inoculate one hundred pigs in different ways and with different amounts, and then place an equal number of diseased hogs among them, and some fifty healthy ones, and am confident that I shall be able to previously name the hogs that will withstand the infection on such exposure.

When these results are compared with those made by vaccine inoculation to prevent anthrax, they seem to show that the time in which an artificial immunity can be produced in susceptible animal organisms is dependent upon the virulence of the disease in question; that

is, that the time in which artificial immunity can be produced in any given disease will be found to depend upon the rapidity of the course of said disease, under natural conditions. Take anthrax, for instance, a disease the course of which can better be counted by hours than by days, according to the reports which have come to us of the results with Pasteur's vaccine, and the methods used to inoculate show that even in that disease it takes from fifteen to twenty days to produce a reliable artificial immunity, but even then, in this case, there seems to be a want of exact experimental data fixing this period. The animals are first inoculated with a weak vaccine, and ten days afterwards with a stronger one, when they are considered to be free from any danger to natural infection. But the all-important question, when this period absolutely begins, has not been satisfactorily determined.

With regard to the swine plague, my idea is, that as this disease is not so acutely fatal, that this period will be found to be longer, say thirty days, and that it cannot be reduced without using a virus so strong as to be dangerous.

Another difficulty which we had to deal with this year was the uncertainty of the natural virus in its virulence. As is well known, the disease has been unusually mild in Nebraska during the summer and fall of 1886, and even in different localities it has varied much in its virulence. In some cases it took very much greater quantities of the same kind of culture to produce death than others. Another fact of great practical importance in the endeavor to obtain a reliable vaccine is the rapidity with which the germ of swine plague loses in virulence under artificially cultivated conditions, as well as the irregularity in this direction between the germs of different cultures in different tubes, which were, however, all inoculated from the same original material and at the same time.

These difficulties do not exist with anthrax to any such degree, though the cultivations do lose in virulence after the same original culture has been passed through many successive artificial generations, as has been shown by Germany's great pathogenic bacteriologist, Robert Koch.

The really unpleasant and disturbing characteristics of the germ of swine plague surmount the production of a reliable vaccine with dif-

ficulties which can be overcome, however. Pasteur claims for his anthrax vaccine, as well as that for rouget and even rabies, that when a cultivation of the germs has been subjected to a certain known line of treatment, and a certain degree of attenuation attained, that this degree of attenuation remains constant; that is, that a vaccine of the same and a constantly reliable degree of attenuation can always be manufactured from inoculating or sowing fresh infusions of sterilized bouillon, and so on indefinitely. This assertion is contradicted by the above mentioned experimentally confirmed conclusions of Koch with regard to the bacillus of anthrax losing in virulence after being carried in successive generations through some fifty cultivations.

This, like the majority of Pasteur's assertions, needs the confirmation of exact test experiments.

With regard to the germ of the swine plague, our own and other experiences go to show that no such constancy of virulence or attenuation can be depended upon through any large number of successive artificial cultivation, but, as said before, it will be necessary to discover some one among the smaller animals (or in case of necessity, by use of young pigs) that have a very excessive degree of susceptibility to the germ of swine plague, and in which it soon acquires its degree of virulency by being passed successively through a small number of said animals, in order to obtain material which can be relied upon to manufacture vaccines from. This is not the difficult task it appears to be.

Lincoln, Jan. 22, 1887.

NEBRASKA SILVA.

The following, it is thought, is a fair list of forest trees growing in Nebraska. All named are not indigenous. Some have been introduced and found to be well adapted.

Ash (white), *fraxinus Americanus*.

Ash (green), *fraxinus viridis*.

Ash (blue), *fraxinus quadrangulata*.

Ash (red), *fraxinus pubescens*.

Ash (water), *fraxinus platycarpa*.

Ash (black), *fraxinus sambucifolio*.

Ailanthus, *glandulosa*.

Arbor Vitæ, *thuja occidentalis*.

Arbor Vitæ, *thuja orientalis*.

Birch (red), *betula nigra*.

Birch (white), *betula alba*.

Balm of Gilead, *populus candicans*.

Black Locust, *robina pseudacacia*.

Black Haw, *viburnum prunifolium*.

Buckthorn, *rhamnus*.

Buckeye, *æsculus glabra*.

Buckeye, *æsculus flava*.

Buckeye, *æsculus pariflora*.

Box Elder, *megundo aceroides*.

Catalpa, common, *bignonioides*.

Catalpa, hardy, *speciosa*.

Catalpa, Japan, *kaempferi*.

Catalpa, golden.

Cottonwood (white), *populus monolifera*.

Cottonwood (yellow), *populus heterophylla*.

Cottonwood, *populus angulata*.

Cottonwood, *populus angustifolia*.

Cottonwood, *populus trichocarpa*.

- Dogwood, *cornus Florida*.
Dogwood, *cornus canadensis*.
Dogwood, *cornus sericea*.
Dogwood, *cornus stolonifera*.
Dogwood, *cornus asperifolia*.
Elm (white), *ulmus Americana*.
Elm (red), *ulmus rubra*.
Elm (slippery), *ulmus fulva*.
Elm (corky), *ulmus alba*.
Elm (winged), *ulmus alata*.
Elder, *sambucus canadensis*.
Elder, *sambucus pubens*.
Hop tree, *ptelea trifoliata*.
Hazel-nut, *corylus Americana*.
Hazel-nut, *carylus rostrata*.
Hickory (shag bark), *carya alba*.
Hickory (shell-bark), *carya sulcata*.
Hickory (white-heart), *carya tomentosa*.
Hickory (pig), *carya porcina*.
Hickory (bitter), *carya amara*.
Hackberry, *celtis occidentalis*.
Honey Locust (thorned), *gled triacanthus*.
Honey Locust (thornless), *gled monesperma*.
Indian Arrow, *euonymus atropurpureus*.
Iron Wood, *ostrya Americana*.
Juniper (Red Cedar), *juniperus Virginiana*.
Juniper (Irish), *juniperus communis*.
Juniper (creeping), *juniperus sabina*.
Kentucky Coffee Tree, *gym. canadensis*.
Larch Larix, *Europea*.
Larch Larix, *Americana*.
Lombardy, *populus dilatata*.
Linden (basswood), *tilia Americana*.
Mulberry (red), *morus rubra*.
Mulberry (white), *morus alba*.
Mulberry, Downing's Everbearing.

- Mountain Ash, *pyrus Americana*.
Mountain Ash, *pyrus Europeanus*.
Maple (soft), *acer dysacarpum*.
Maple (sugar), *acer saccharinum*.
Oak (white), *quercus alba*.
Oak (post), *quercus obtusiloba*.
Oak (burr), *quercus macrocarpa*.
Oak (chestnut), *quercus primes*.
Oak (chinquapin), *quercus pumila*.
Oak (Dw. chinquapin), *quercus prinoides*.
Oak (swamp), *quercus palustris*.
Oak (black), *quercus nigra*.
Oak (red), *quercus rubra*.
Oak (scarlet), *quercus coccinea*.
Oak (royal), *quercus robur*.
Osage Orange, *maclura aurantiaca*.
Pecan, *carya olivæformis*.
Prickly Ash, *zanthoxylum Americanum*.
Pine (Scotch), *pinus sylvestris*.
Pine (Austrian), *pinus Austriaca*.
Pine (white), *pinus strobus*.
Pine (twisted), *pinus contorta*.
Pine (mountain), *pinus pungens*.
Poplar, *liriodendron tulipifera*.
Paw-Paw, *asimina triloba*.
Quaking Asp, *populus tremuloides*.
Red Haw, *crataegus cestivus*.
Red Bud, *cercis canadensis*.
Sycamore, *acer pseudo platanus*.
Spruce (Norway), *abies excelsa*.
Spruce, *abies Menziesii*.
Spruce, *abies Douglassii*.
Spruce (silver), *abies grandis*.
Spruce (balsam), *abies balsamea*.
Spruce (hemlock), *abies canadensis*.
Sumac (staghorn), *abies rhus, typhina*.

- Sumac (dwarf), *abies copallina*.
Sumac (poison oak), *abies toxicodendron*.
Silver Leaf Poplar, *populus alba*.
Sassafras, *S. officinale*.
Walnut (black), *juglans nigra*.
Walnut (butternut), *juglans cinerea*.
Wild Cherry (black), *prunus serotina*.
Wild Cherry (choke), *prunus Virginiana*.
Wild Cherry (bird), *prunus padus*.
Willow (red), *salix purpurea*.
Willow (basket), *salix viminalis*.
Willow (brittle), *salix fragilis*.
Willow (grey), *salix cordata*.
Willow (yellow), *salix aurora*.
Willow (bay), *salix lucida*.
Willow (powder), *salix longifolia*.
Willow (black), *salix nigra*.
Willow (white), *salix alba*.
Wild Grape (fox), *vitus labruska*.
Wild Grape (summer), *vitus cæstivalis*.
Wild Grape (frost), *vitus cordifolia*.
White Thorn, *cratægus coccinea*.
Wild Plum, *prunus Americana*.
Wild Plum, *prunus domesticata*.
Wild Plum, *prunus spinosa*.
Wild Plum, *prunus insititia*.
Wild Crab Apple, *pyrus coronaria*.
Wild Crab Apple, *pyrus angustifolia*.
Yellow Locust, *robina viscosa*.

NEBRASKA SALINE LANDS.

FROM THE REPORT OF THE BOARD OF PUBLIC LANDS AND BUILDINGS, DECEMBER
1, 1886.

SALINE LANDS AND SALT WELL.

The board of public lands and buildings, before proceeding to carry out the provisions of an act of the legislature, entitled "An act to provide for the sale and leasing of the saline lands and the development of the saline interests of the state of Nebraska," deemed it advisable and for the best interests of the state to take such steps as would cause the surrender and forfeiture of a certain lease contract that covered the big salt basin and some of the contiguous lands.

This lease contract was held by the Western Salt Association, of Chicago, Illinois, as assignees. It had been given by the state, bearing date February 15th, 1869, for the term of twenty years, and hence would not have expired by virtue of limitation until February 15th, 1889. With a view to having this lease canceled, in order that the state might become fully possessed of said premises, the board of public lands and buildings, on the 6th day of June, 1885, made an order directing the attorney general to take such steps as might in his opinion be necessary to procure its surrender or forfeiture.

The unconditional surrender of this lease contract was finally secured by the attorney general, and by him filed in this office on the 6th day of October, 1885.

The saline lands had in the meantime been appraised, and the returns thereof made to the board by the commissioner of public lands and buildings, under an order of the board made July 28th, 1885.

The state having secured possession of the big salt basin and the adjoining lands, the board of public lands and buildings made an order on the 7th day of October, 1885, directing the commissioner to advertise, and offer at public sale, the saline lands of the state, or so much thereof as should be necessary to realize the sum of \$20,000, and then adjourn the sale to the first Monday in April, 1886. This sum being,

in the opinion of the board, sufficient to sink a well and demonstrate whether or not brine of sufficient quantity, quality, and strength could be secured to warrant the manufacture of salt.

Pursuant to the above order, the land was duly advertised for sale, and on the 12th day of November, 1885, the following described lands were sold, from which was realized the sum of \$20,027.50, viz.: All of section number 8, in town number 9, range number 5 east; the south half and the north-west quarter of section number 24, in town number 9, range number 5 east; the north half of section number 4, in town number 10, range number 5 east; and the north-east quarter of section number 14, in town number 10, range number 5 east, making in all 1,584 acres. The sale was then adjourned to Monday, the 5th day of April, 1886.

By order of the board, the sale of this land has since been adjourned from time to time without any offering, and now stands adjourned to the first Monday in April, 1887. None of this land has been sold, however, nor offered for sale, except the tracts as above described.

All the proceeds realized from the sale were immediately deposited by the commissioner of public lands and buildings in the state treasury, and a detailed statement made to the board of public lands and buildings of the lands sold, as provided by section 2 of said act.

The commissioner then, under instructions of the board, solicited proposals by advertisement for the sinking of a well on the big salt basin.

In response to this advertisement nine proposals were filed, and on the 22d day of December, 1885, they were opened by the board of public lands and buildings. These bids ranged from \$10,125 to \$25,000. After a careful examination of all the proposals made, the bid of M. C. Bullock Manufacturing Company, of Chicago, Illinois, was found to be the lowest and most practical, and hence was accepted and contract awarded to said company.

The board of public lands and buildings then authorized and instructed the commissioner to make and enter into a contract on the part and behalf of the state with said company for the sinking of said well. In compliance therewith, a contract was made and executed.

It fully explains the nature and extent of the work, and reads as follows, viz. :

CONTRACT.

This contract, made and entered into this 8th day of January, 1886, by and between M. C. Bullock Manf'g Company, of Chicago, Illinois, by M. C. Bullock, president, and George Woodland, secretary of said company, on the part and behalf of said company of the first part, and the state of Nebraska, by Joseph Scott, commissioner of public lands and buildings for the state of Nebraska, on the part of the said state of Nebraska, party of the second part, Witnesseth:

That for and in consideration of the payments to be made, as hereinafter set forth, by the said party of the second part, the said party of the first part hereby agrees to furnish a plant of drilling machinery, and all materials and labor necessary for the sinking and full completion of a well on the big salt basin, near the city of Lincoln, Nebraska, at a point on said basin to be designated by the board of public lands and buildings of the state of Nebraska, and to sink and fully complete said well to a depth of two thousand feet, unless the sinking of said well be sooner discontinued by the board of public lands and buildings, as hereinafter agreed and stipulated, and then, and in that case, to stop boring and leave it in a complete state as far as sunk at time of being so discontinued. Said well to be tubed with iron tubing of sufficient thickness to effectually exclude all veins and flows of fresh water passed through in sinking the same, and the bored hole to be of the same diameter and finish as follows, to-wit:

First. To commence putting down a wrought-iron stand-pipe, at least five inches (5) inside diameter, and one-fourth ($\frac{1}{4}$) of an inch thick, through all clay, soil, sand, and loose materials, down to solid rock, making a water tight joint in the rock, so as to shut off all surface water or flows of water, sand, etc., passed through, and also to bring all drill cuttings to the surface.

Second. Then to commence boring in the rock with a bit about four and five-eighths ($4\frac{5}{8}$) inches in diameter, taking out a core about three and seven-eighths ($3\frac{7}{8}$) inches in diameter, until water seams, or loose, broken materials are encountered in such quantities as to neces-

sitate casing the well, at which time is to be inserted a wrought-iron casing, about four and one-half ($4\frac{1}{2}$) inches outside diameter, drilling this casing down past seams or loose materials and making a water-tight joint in the rock below.

Third. Then continue the boring through this casing with a bit about three and thirteen-sixteenths inches ($3\frac{13}{16}$) in diameter, taking out a core of about three inches (3) in diameter the entire depth, provided seams of water or loose strata are not again encountered, in which case another casing is to be inserted about three and three-quarter inches ($3\frac{3}{4}$) outside diameter, again making a water-tight joint in the bottom as named above.

Fourth. Again, continue boring to the required depth with a bit about three inches (3) in diameter, taking out a core about two and five-sixteenths inches ($2\frac{5}{16}$) in diameter, provided seams of water or loose strata are not again encountered, in which case another casing is to be inserted about two and seven-eighths inches ($2\frac{7}{8}$) in diameter, making a tight joint in the bottom as named before, and again continue boring to the required depth with a bit about two and one quarter inches ($2\frac{1}{4}$) in diameter, taking out a core about one and five-eighths inches ($1\frac{5}{8}$) in diameter.

Fifth. If found necessary to case the hole the entire depth, another casing a trifle smaller than the bit last used shall be inserted, and the party of the first part shall have the right to remove all of the larger sizes of casing. Said party of the first part shall also have the right to make any required changes of casing, provided larger sizes than those specified are substituted in their place.

Sixth. All drill cuttings to be brought to the surface, and the well to be sunk in such a manner as will enable the geologist to keep a complete geological record of all strata passed through. And the said first party further agrees to commence the sinking of said well on or before the first day of March, 1886, and to employ and use the proper materials, force, and labor necessary to push the same to completion at as early a date as practical.

And in consideration of the sinking of said well, as above set forth by the first party, the said party of the second part hereby agrees to pay to the said first party as per the following schedule of prices in the manner, at the times, and with the modifications as hereinafter set forth and agreed upon by and between the parties to this contract, viz.:

For the first five hundred feet, six dollars and fifty cents per foot; for the next three hundred feet, six dollars per foot; for the next two hundred feet, five dollars and fifty cents per foot; for the next two hundred feet, five dollars per foot; for the next two hundred feet, four dollars and fifty cents per foot; for the next two hundred feet, four dollars per foot; for the next two hundred feet, three dollars and fifty cents per foot; for the next one hundred feet, three dollars per foot; for the next one hundred feet, two dollars and seventy-five cents per foot.

Payments to be made as follows, to-wit: When the hole shall have been sunk and cased to the depth of five hundred feet, seventy-five per cent of the contract price for said five hundred feet, and seventy-five per cent of the contract price on each additional five hundred feet so sunk and cased, and the balance when the well shall have been completed and accepted by the board of public lands and buildings.

And it is hereby further understood and agreed by and between the parties to this contract that the said party of the second part hereby reserves, and has the right and privilege to order the sinking of said well discontinued at any desired depth that may be deemed advisable by the board of public lands and buildings of the state of Nebraska, to best subserve the interest of said state, and the party of the first part to receive pay only for the exact number of feet sunk, cased, and completed at the time of such discontinuance, as per schedule of prices named above. And it is further agreed and understood that the proposal made by the first party for the sinking of said well, and letter accompanying the same, together with the advertised notice for proposals, and the law authorizing the sinking of said well, are hereby

made part of this contract. This contract subject to the approval of the board of public lands and buildings, as provided by law.

In witness whereof, we have hereunto set our hands and seals this eighteenth day of January, 1886.

(Signed),

[SEAL.]

[SEAL.]

In presence of

(Signed),

O. H. BLANKE,

C. M. CARTER.

M. C. BULLOCK MANF. CO.,

M. C. BULLOCK, Pres.,

M. C. BULLOCK MANF. CO.,

GEO. WOODLAND, Sec'y.

JOSEPH SCOTT,

Com. Pub. Lands and Buildings, State of Nebraska.

The contractor presented a good and acceptable bond in the sum of \$10,125, conditioned for the faithful performance of the requirements of the contract. The contract and bond were both carefully examined and approved by the board of public lands and buildings.

Owing to the bad condition of the weather, the contractor was unable to get his boiler, engine, and drill plant on the ground and set ready for work until in the month of April. This being accomplished, the work progressed with varied degrees of success, and the well is now sunk to the depth of 1,199 feet, and cased with wrought iron tubing four inches in diameter.

B. P. Russell, geologist, who was employed by the board to keep a geological record of the strata passed through, as provided by law, submits the following report, viz.:

To the Honorable Board of Public Lands and Buildings:

It becomes my duty at this time to report to you the work accomplished in sinking the test well on what is known as the Big Salt Basin, two (2) miles west of the city of Lincoln. Many drawbacks have occurred, as is usually the case in such undertakings, so that we are not as near completion as we had expected to be at this date.

The contract was let to M. C. Bullock, of Chicago, on the 22d of

December, 1884. The plant was set on the 7th of April, 1886, and the time between this and the third day of May was consumed in adjusting machinery, with its necessary work, preparatory to sinking the well, being at this time only 35 feet.

The first pipe used was nine (9) inches in diameter, which was sunk to the depth of forty-nine (49) feet. At this place the gravel was so compact that it was thought best to insert a seven (7) inch pipe and proceed with that. This seven (7) inch was used until rock was reached at two hundred and six feet and four inches (206.4).

The formations thus far on the salt basin are not as elsewhere in the state. Generally, on leaving the soil proper, we pass into the loess formation, which is composed to a great extent of silica, being called by Dr. Hayden the "bluff formation," and while it is not in keeping with this report to describe the formation alluded to, I wish to record the fact that after passing through about two feet of sandy soil, we at once came to coarse sand and gravel, and struck no hard strata until we reached a conglomerate rock at two hundred and five (205) feet. All above this is stratified sand and gravel, while iron pebbles are common in the sand of the lower beds.

At one hundred and nineteen feet (119) we passed through brine which tested twenty-one degrees (21) by the hydrometer, and which raised in the pipe about six (6) feet above the water level of the basin.

The sand was closely packed below this, offering considerable resistance to the pipe as it was put down by hydraulic pressure. The firmness of this sand would not allow the water to pass freely through it at any point, and in some cases it was impervious to water.

At the depth of one hundred and ninety-five feet (195) we reached a stratum of ten feet (10) of coarse gravel, through which water flowed with the greatest freedom, raising in the pipe three (3) feet above the level of the water on the basin. It tested thirty-five degrees (35) of strength.

To test fully the quantity of the flow the steam pump was attached, and was kept running from noon until half past eight the following morning, pumping at least forty (40) gallons per minute, the water in the pipe being lowered about eighteen feet.

I think with the pipe at the bottom of the gravel, for two hundred and five (205) feet, a four-inch stream of water could be continually pumped which I believe would test forty degrees (40), as the water would be drawn from the bottom of the flow instead of from the top. I make this conclusion from the fact that at times the water would go up to that point.

The seven (7) inch pipe was left here, so that if at any time in the future the brine should be used, the inside pipes can be withdrawn and this seven (7) inch pipe left for use.

The conglomerate rock on which the pipe rests proved to be less than one (1) foot in thickness, but is underlaid with coarse sandstone which was too soft to core until we reached the depth of two hundred and forty-four (244) feet. At this point we passed through three (3) feet of clay, then from this point to two hundred and sixty-seven (267) feet was soft sandstone, and did not core. It was thought then advisable to case through this soft formation, hence a five (5) inch casing was inserted, which was sunk two hundred and sixty-nine (269) feet.

The bit used from two hundred and five (205) feet to three hundred and sixty-six (366) feet gave us a four (4) inch core. From two hundred and sixty-nine (269) feet the hole was cased with four (4) inch casing, which was put down inside the five (5) inch. This went to three hundred and sixty-five (365) feet.

The hole from this point on gave us a two (2) inch core, and no casing was used for some time, as the nature of the rock was such that it was not necessary.

At four hundred and two (402) feet we passed through a stratum of thirty-six (36) feet of dark slate shale, containing considerable iron pyrites.

From now on we have more thick strata than heretofore. At four hundred and eighty (480) feet the limestone is twenty-five (25) feet thick, fine in texture and good in quality. Again, at five hundred and seventy-eight (578) feet a deposit of fifty (50) feet.

It is quite impossible for me at this time to make a report that shall be wholly reliable in all its particulars, as I have no facilities to make a complete analysis of the shells by which accuracy may be

hoped for. All indications go to show that these deposits were laid down in shallow, brackish water at the close of the long carboniferous period. In my final report I hope to be able to give a full account of the different formations from a paleontological standpoint. The clay shale and limestone strata are rich in shells and these make up the great bulk of the deposits as far as we have gone.

At nine hundred and forty-two (942) feet we pass through four (4) inches of coal. The dark shale above it of one foot and eight inches (1.8) contains some coal, and it is possible that in some points near by the vein may be two (2) feet. But the six (6) feet of limestone below does not indicate a seam of any value, for in that case we should find the bottom clay of the coal beds.

At ten hundred and forty-four (1044) feet the caving of the shale in places above, by being dissolved in the water, made it necessary to cease. The four (4) inch casing was therefore drawn out and the whole reamed to the aforesaid depth, when the four (4) inch casing was sunk to the depth of ten hundred and seventy-six (1076) feet, where it now rests. From this last depth magnesian limestone prevails to the depth of eleven hundred and ninety-nine (1199) feet.

In the investigation of salt manufacturing as directed by the board of public lands and buildings, I find that at Syracuse, N. Y., no brine is used that tests less than sixty-five degrees (65). From different wells brine is worked, testing from (65) to ninety-five degrees (95). In Michigan, the official state standard is one hundred degrees (100). In the province of Ontario, Canada, it is ninety-five degrees (95). Rock salt being discovered in Louisiana which has been found to be one hundred and forty-four (144) feet in thickness, has entirely stopped the evaporation of brine.

As the water of the artesian well on the government square in Lincoln was reported to be about fifty degrees (50) in strength, it was with great interest that we watched for the same flow here. The report of that well showed it to be found at five hundred and fifty-five (555) feet. We did not find it here until we reached the depth of six hundred feet and six inches (600 ft. 6 in.) It only tested twelve degrees (12) and was found in a porous stratum of red sandstone twenty inches in thickness.

Again, at eight hundred and twenty-eight (828) feet, and about the same thickness of the same material, a second flow was found which tested sixteen degrees (16). The combined flows furnished, we estimated, forty (40) gallons per minute, and raised fifty feet (50) in pipes above the ground.

In closing my report I wish to say that I have avoided technical phraseology as far as possible, so that all may know the facts brought out by this test of boring. There will be beyond doubt quite a change in my final report in some of the formations. The freshness of the core in many places made it necessary for them to be put away immediately. These cores have to be broken and separated to a greater or less extent in making a technical report, and for that reason it was thought advisable to defer this work until the well was finished.

It is with pleasure that I avail myself of this opportunity to express my thanks to the honorable gentlemen of the board of public lands and buildings for the uniform kindness and co-operation they have extended to me from the beginning. I wish also to make mention of the fact that I have received many letters of inquiry and expressions of interest in our attempt to investigate our mineral resources, together with valuable reports from geologists of other states, and gentlemen interested in this branch of science. And lastly, that the Department of the Interior and the War Department have shown great kindness in placing in my hands all books, maps, and charts at their disposal.

I have the honor to be,

Your most obedient servant,

B. P. RUSSELL,

Geologist in Charge.

Following is the record of strata:

	FT.	IN.
Sandy soil	4	
Fine greenish sand	16	
Sand little darker in color	4	8
Coarse gravel	23	7
Gray sand	4	9

	FT.	IN.
Coarse gravel	4	
Fine yellow sand.....	17	
Whitish sand.....	26	
Same, gravel and iron pebbles	12	6
White sand and gravel	21	3
White sand	1	3
Yellow sand	12	8
Yellow sand and gravel	16	8
Yellow sand and small iron pebbles	15	4
White sand, common gravel	15	4
Very coarse gravel	7	
Coarse gravel and conglomerate.....	3	
Coarse sand with chalky, flinty pebbles	2	6
Reddish colored clay.....		6
Porcelain clay	4	10
Gray sandstone	30	3
Clay	3	4
Buffish colored sandstone	19	4
Clay	2	
Impure chert.....		8
Clay shale	3	5½
Limestone	4	7
Clay shale		10
Sandstone		9
Dark gray sandstone.....	21	8
Dark shale	11	2
Limestone	11	
Slate shale	4	6
Limestone	7	
Greenish slate shale	1	
Sandstone, pinkish	8	10
Black shale	3	1
Lighter of same	4	7
Sandstone	7	6
Reddish brown shale	1	5

FT. IN.

Brown shale	1	
Sandstone	2	10
Dark shale	9	6
Limestone	6	
Shale	2	6
Limestone		10
Very dark shale	2	
Greenish variegated shale	6	2
Reddish shale	10	
Dark shale	36	11
Dark shale layers of limestone	9	9
White hard limestone.....	5	2
Dark shale	8	
Limestone	4	
Shale	1	9
Limestone	1	2
Sandstone	1	6
Slate shale greenish.....	5	1
Brownish shale	1	6
Dark shale	2	1
Very hard white limestone	25	
Gray sandstone	2	
Red sandstone.....	37	9
Variegated limestone	10	
Red shale.....	10	4
Hard white limestone	8	6
Dark shale.....	5	
Limestone variegated and porous.....	50	2
Dark shale.....	4	
Limestone	1	8
Greenish slaty shale	8	
Red shale.....	9	
Limestone variegated	9	6
Red shale with layers of red sandstone	13	
Limestone	5	4

	FT. IN.	
Slate shale	2	3
Hard white limestone	14	
Dark shale	1	6
Limestone	1	
Slate shale	3	4
Red shale.....	6	6
Limestone with red shale	2	4
White limestone	5	6
Coarse marble	1	8
Limestone	5	
Red shale.....	3	6
Slate shale		4
Variegated limestone	32	8
Dark shale	1	4
Limestone	3	7
Flint		4
Limestone	11	10
Slate shale	10	4
Limestone	17	6
Slate	1	
Black shale	1	
Slate shale	13	
Red shale	1	6
Slate shale		5
White limestone	8	6
Red shale	1	7
Limestone	2	
Slate	3	
Dark shale	4	
Slate.....	2	2
Limestone	9	6
Slate shale	2	6
Dark shale.....	7	8
Red shale	5	
Limestone	13	4

	FT.	IN.
Very dark shale	7	
Green shale with limestone	7	9
Limestone	6	
Dark limestone	10	
Shaly limestone.....	5	6
Dark shale	2	6
Slate shale	4	
Limestone	4	
Green shale	3	
Limestone variegated	10	10
Dark shale	1	8
Coal	4	
Shale	3	6
Limestone	6	3
Slate shale	1	10
Red shale	7	2
Variegated limestone	1	
Black shale	5	
Clay shale	9	9
Limestone with some clay	15	9
Slate shale	2	
Limestone		6
Slate shale	7	2
Limestone	4	
Brown sandstone	8	
Sandstone	3	
Brown shale	2	4
Limestone		11
Brown shale	2	3
Limestone	1	3
Black shale	2	4
Limestone	6	
Limestone with layers of clay	4	
Clay shale	7	3
Limestone	3	11

	FT. IN.	
Slate shale	4	9
Limestone	3	
Sandstone	3	6
Reddish sandstone.....	10	
Limestone	2	
Red shale	5	7
White limestone	19	8
Red sandstone	1	
Limestone	1	9
Quartz	4	
Flinty limestone	1	10
Limestone magnesium	83	1
Limestone magnesium with clay and chert	15	1
		<hr/>
Total	1199	1

From this report it will be seen that brine of sufficient quality and strength to warrant the manufacture of salt or to satisfy the requirements of law, has not yet been secured. It is the intention of the board of public lands and buildings to have the sinking of the well continued to the depth of 2,000 feet, unless something of enough value and importance be sooner reached to warrant its discontinuance.

NEBRASKA STATE FISHERIES.

With the assistance of the Nebraska state board of agriculture, the state fish commission made an elaborate exhibit at the state fair September, 1886. A special committee, consisting of H. M. Bushnell, J. D. Calhoun, and D. D. Johnson, was appointed to examine and report as to this exhibit. The following is the report made:

In the new commodious building near the headquarters building on the fair grounds may be seen the most interesting and instructive exhibit ever shown on a fair ground. It is the exhibit of the Nebraska fish commission, made by Commissioner W. L. May, of Fremont, to whom the vast throng of visitors are indebted for this novel and interesting feature, and who has the credit of making the first complete fishery exhibition ever made at a state fair in the United States. To say that Mr. May is an enthusiast in piscatorial matters is but a mild statement, and he has devoted six months' time in preparatory work for gratifying results now reached, work that required extended visits on his part through the Eastern states in making these collections now displayed to Nebraskans, and Nebraska visitors. At the winter meeting of the state board of agriculture, Mr. May secured that body's cooperation and interest sufficient so that they made an appropriation for a building on the grounds for an exclusive fish exhibit. With that secured Mr. May went at the work now happily and successfully consummated. The building containing the fish exhibit is built especially for the purpose of its use, and is nicely finished and furnished. In one corner is Mr. May's private office, and through the center of the building is the long row of aquariums brought from the state hatchery at South Bend. These are fed and supplied with constantly moving water from the mains of the city works on the grounds, and in the center of the line of aquariums is a large tank and fountain filled with specimens. In this tank, sunk in the ground, eight or ten varieties of fish disport themselves, while turtles keep them company; craw-fish move around the edges, frogs splash in and out, and a fine

specimen of mud hen, the black mallard of amateur sportsmen, swims around on the surface.

In the aquariums are shown specimens of native fish of the state, and the fish cultivated by the fish commission at the South Bend hatchery. The cultivated fishes are shown by specimens of brook trout, of one, two, and three years of age; mountain trout, six months, one, and two years; black bass, three years old; wall-eyed pike, six months of age; German carp, the mirror and scale varieties, of one and two years of age, magnificent specimens, all of them. The selection of native fishes exhibited includes pickerel, buffalo fish, quill backs, cat fish, sun fish, bull heads, hickory shads, besides the assortment of turtles, craw-fishes, water beetles, and such. In addition to these live exhibits the commission shows forty jars from their hatchery containing alcoholic specimens of the above varieties, as well as fish spawn, frog spawn, toad spawn, water beetles, water fleas, etc.

Apparatus for work from hatchery includes jars, cans, trays, and other articles used in caring for the spawn and very young fish, illustrative of the way water is kept moving in and out among them, and the mode of handling and caring for the young.

Mr. May's donation to the exhibit from his own private property is no small item in the aggregated whole. Along the walls are twenty elegant pictures, 22x28 each, inside, representing the game fishes of America. These are copies from water colors, painted by Kilbourn, the great sketch artist and producer of game fish on canvass.

The art life size crayon portrait of Spencer F. Baird, United States fish commissioner, the portrait the property of Mr. May, also occupies a conspicuous place on the right side of the hall. Thirty pictures, sketches in colors, of fish, and two dozen embossed pictures of game fish, all of which aid in adorning the walls, all from Mr. May's private collection, and from the same person are exhibited sixty lithograph views of ocean and inland fishes. But perhaps the finest of all of Mr. May's collection on exhibition, are found in his collection of marine invertebrate and deep sea fishes that are exhibited in different jars, the specimens being preserved in alcohol. These are all of more than absorbing interest and are equal to curiosities in the government department at Washington. Mr. May also has in his exhibit one

hundred photographs, 10x14 in size, representing all phases of fishing life, coast stations, boats, manner and methods of taking, and are in fact the government coast series of views referring to halibut, mackerel, cod fisheries, etc. These photos are the work of Smillie, the government photographer at the Smithsonian institute.

Fine arts in fishery scenes can be seen and appreciated in a study of fifteen large pictures, 30x40 in size, representing the fishing industries of the country. These are enlarged views from photographs and were loaned for the present exhibit at the Nebraska state fair by Prof. Spencer F. Baird, and are a part of the exhibit in the national museum at Washington. They are very choice pictures that have never been on exhibition before outside of the national museum. A collection of marine invertebrate are shown that came from the government collection at Washington, also fifty 16x20 pictures of ocean and freshwater fishes that adorn the south walls of the building and make a most attractive part of the exhibit.

E. G. Blackford, of the New York fish commission, has loaned for the display a fine collection of ocean fish, stuffed specimens that are as natural and true to nature as life itself. The specimens comprise the following list of ocean fish, varying in length from six feet down. The list comprises porpoise, thrasher shark, parrot fish, short nosed gar, sucking fish, dusky shark, trigger fish, lump fish, red snapper, dolphin, hawk fish, smooth puffer, cobia, long nosed gar, hammer head shark, moon fish, star fish, angel fish. This is one of the great attractions in the building, and if the party who has kindly aided Mr. May in making his collection could see the crowds they would realize how much the show is appreciated.

From Michigan Mr. F. N. Clark, in charge of the branch United States hatchery at Northville, Mich., has loaned for this exhibit a large assortment of alcoholic specimens, as follows: Twelve specimens of California trout, twelve specimens of brook trout, nine specimens German trout, six specimens Loch Leven trout, one Battle Lake trout, six specimens of white fish, six specimens of graylings. Mr. Clark's specimens as furnished are very correct and life-like.

From Illinois Mr. May has secured one of the most attractive set of exhibits to be seen in the building. These are plaster casts of the

fish common to the waters of Illinois, and number twenty-five specimens that are loaned by the Illinois fish commission. These casts were prepared for the New Orleans Exposition and exhibited there, and are as life-like as real fish in the streams. Mr. May secured these handsome specimens through the kindness of Mr. S. E. Bartlett, secretary of the Illinois commission.

Mr. A. Booth, the greatest fresh fish dealer in the United States, whose headquarters are in Chicago, has loaned Mr. May a fine collection of fish specimens, including a stuffed porcupine fish, shark's jaw, bills of saw and sword fish, horse shoe crab, etc. These specimens occupy a panel in the north wall and are always viewed by an eager crowd.

Commissioner May has had taken and they are exhibited with the rest of the handsome things in the building, six large views of the state fishery of Nebraska, located on Platte river opposite the village of South Bend, also one large frame of views of the same place, hung in close proximity to the larger picture. Another picture on the wall is a collection of cabinet photographs of the officers of the American fishery society. These pictures include those of the following: President, Wm. M. Hudson, of Hartford, Connecticut; vice president, Wm. L. May, of Fremont, Nebraska; recording secretary, Fred Mather, of New York; corresponding secretary, Wm. A. Butler, Detroit, Mich., and treasurer, E. G. Blackburn, of New York. Another frame near at hand contains the picture of the Nebraska fish commission, Messrs. Livingston, Kennedy, and May.

A cordial reception is most heartily extended to every visitor to the handsome exhibit on the fair ground, and no building from morning to night witnesses the crowds that are always gathered at this interesting place. Commissioner May and Superintendent M. E. O'Brien, of the state hatchery, have been on the grounds all the time, showing visitors around, and making it pleasant for all. Mr. O'Brien keeps a watchful eye over its numerous charges sporting in the aquariums, and Mr. May has a hand extended to all. The little office room is always open to his friends, and the wayfaring newspaper man, and even the bait room comes in for its always interesting and entertaining investigations. To say that the fish exhibit at this present state fair is

a grand and unqualified success, is but voicing the sentiment that 50,000 people express, who have seen the work Mr. May has done, and pronounce it a feature of the great fair of 1886.

THE NEBRASKA STATE INDUSTRIAL COLLEGE.

REPORT OF THE DEAN COVERING THE PERIOD OF TWO YEARS, 1885 AND 1886.

I. WHAT HAS BEEN ACCOMPLISHED IN THE BIENNIUM.

In my report made to you two years ago, and which was published in the chancellor's report to the board of regents, I outlined what appeared to me to be the proper policy of the industrial college. This policy was adopted by the regents, and since that time progress has been made along the lines then suggested.

It is fitting that I should now make in summary form a statement of what has been accomplished during the biennium just closing.

1. *Courses of Study.*—Both courses of study, viz., that in agriculture and that in civil engineering were revised early in 1885. The changes in the last named course were not great, the sequence of studies in the old course being very good. Some branches were added, various minor changes were made, all looking to strengthening the course, and making it a better means of training young men for the profession of civil engineer. The course in agriculture was radically changed. In the new course the effort has been made to provide a first-class college education in those branches of learning which are related to agriculture in all its departments. The preparatory studies, language and mathematics, so necessary to the investigator, are insisted upon as essentials in the foundation for a good education of any kind.

The sciences of chemistry, physics, botany, zoology, and geology are required next, as furnishing the only possible basis for a knowledge and practice of scientific agriculture. Last of all, come the ap-

plications of these sciences in the study of soil, the chemistry of feeding, the principles of machinery, the growing of plants, the structure and care of animals, and the discussion of the theory and practice of the various branches of agriculture. An education, such as this course provides, can be confidently said to fit a man for the enjoyment and practice of rural pursuits, as no other course can.

2. *Better opportunities for Study and Investigation.*—The bienium has been marked by a notable increase in the facilities for study and investigation in those lines which are of most direct interest to the patrons and students of the industrial college. The erection of a chemical laboratory has enabled the teachers in charge of every science to offer better and more frequent opportunities for the personal study of the plants, animals, rocks, soils, and chemical and physical forces with which the industrialist has to deal. At the same time something has been done toward intelligent illustration of the applications of the sciences in industrial pursuits.

3. *The improvement of the College Farm.*—When I first became acquainted with the college farm, and began to have a certain responsibility as to its condition and management, I was much pained and chagrined. It was a standing reproach to the industrial college. A report was made by a committee of the state agricultural society in January, 1885, condemning its appearance and condition in the strongest terms. This has all been changed. The farm has been largely freed of weeds, its hedges have been neatly trimmed, buildings and fences have been repaired, the larger building has been repainted, walks have been laid, and the cattle yards rebuilt. It has taken much work and a good deal of money to make these improvements, but the result has been gratifying.

4. *Experiments and Observations.*—Two years ago I urged the desirability of instituting a series of experiments in the several departments of the industrial college, and presented a scheme of experimentation which was adopted by the board of regents. For convenience I reproduce it here.

1. POPULAR EXPERIMENTS.

The regents to institute such experiments upon the college farm as they and the superintendent of the farm shall deem of most importance. An annual report of these shall be made by the superintendent to the regents for publication.

- Topics.*
1. Experiments with stock as to breeding and feeding.
 2. Experiments with various kinds of grain crops.
 3. Experiments with various kinds of grasses and other forage plants.
 4. Experiments upon different modes of culture for various crops, etc., etc., etc.

2. SCIENTIFIC EXPERIMENTS.

The regents to institute in the laboratories, and upon suitable grounds set apart for the purpose when necessary, several series of experiments and observations by or under the charge of the professors in the industrial college. These experiments should in most cases be instituted for terms of years.

The professors should be required to make a careful report of progress at the end of each year to the regents for publication, and at the end of the term of the experiment, or when definite final results have been attained, a final report shall be made in each case with summaries and conclusions.

- Topics.*
1. Full meteorological observations (continuous).
 2. Observations upon soil temperature (five years).
 3. Observations upon the humidity of the soil (five years).
 4. Observations upon the percolation of water through soils (five years).
 5. Chemical and physical analysis of soils (.....years).
 6. The fertility of soils as related to the texture and composition of the subjacent strata (.....years).
 7. The porosity or compactness of soils as affected by cultivation and by burrowing species of worms, insects, and rodents (.....years).

8. The necessity and practicability of irrigation in various parts of Nebraska (.....years).
9. The observation and study of the injurious insects of the state (five years).
10. The observation and study of the injurious fungi of the state (five years).
11. Experiments upon fertilization and cross fertilization of plants (.....years).
12. Experiments upon the proper temperature for the germination of seeds (five years.)

In discussing the subject of experimentation I called particular attention to the fact that there are two classes of experiments, viz., first, those which are popular in character, and which aim to reach immediate results; and, second, those in which the aim is to discover some profound principle, or to establish some fact in nature. The latter may be designated as scientific experiments, to distinguish them from the former, although there should be no difference in the care with which the work is done. The popular experiments when carefully made, may have a high value, but their value is restricted to narrow areas, and affected by many conditions which are constantly varying. The scientific experiments require more time and care for their consummation, but when results are once obtained they have an accuracy and a wideness of application which give them values for all time and in all places.

During the biennium the energies of all the officers of the industrial college have been so largely required in carrying on other work that but little time or strength remained for the making of experiments. It is gratifying, however, to be able to say that work has been undertaken in topics 1, 3, and 4 of the popular series; and that in the scientific series regular observations are now made in the lines designated as topics 1 and 10, while steps have been taken looking to work in topic 5.

A new line of experimentation has been undertaken during the present year, in order to solve, if possible, the question as to the nature of and remedies for the disease of swine, commonly known as

“hog cholera.” Dr. F. S. Billings has been employed to make the investigations, and while it is still too early to venture an opinion as to the results, I am warranted in saying that it is one of the most important labors ever undertaken by the university.

5. *Illustrative Collections.*—The need of illustrative collections in the industrial college is evident, and it requires no argument to show the desirability of promptness in beginning work upon them. The following are some of the collections necessary :

1. A botanic garden, in which shall be grown all the trees, shrubs, and herbs which will endure this climate.
2. A forage garden, consisting of plots containing all the forage plants of temperate climates.
3. A grain garden, consisting of plots containing all the grains of temperate climates.
4. Collections of dried packages of all the grasses and forage plants of the world.
5. Collections of dried packages of all the grain-producing plants of the world.
6. Collections of samples of the grains, seeds, fruits, and vegetables of the world (natural and in wax casts).
7. Collections of the woods of the world, in blocks and samples of manufactures.
8. Collections of the various soils of the state and country.
9. Collections of the building stones of the state and country.
10. Collections of the insects and other animals injurious to the plants and animals of the farm.
11. Collections of the fungi injurious to the plants and animals of the farm.
12. Collections of the tools and implements used in farming and gardening, etc., etc., etc.

Of these, considerable progress has been made upon Nos. 1, 6, 7, 10, and 11.

6. *Students in the College.*—There are now enrolled in the several classes of the industrial college fifteen students, of whom eleven are in the engineering course and four in the agricultural. In this statement no account is made of the pupils in the preparatory department.

Looking back over the records of the last few years, the attendance in college classes in the year 1882-3 is given at fourteen, from which time it has declined to the year 1884-5, when it reached its lowest point, and since which it has been steadily improving. This improvement has been most rapid in the engineering course, but the indications now are for a healthy growth in the agricultural course. In the latter course three of the students come from colleges in other states, viz., one from Chicago university, another from the agricultural department of the university of Illinois, and the third from the Iowa agricultural college.

II. DIFFICULTIES AND PROBLEMS.

In discussing some of the problems which we have in the industrial college, and pointing out some of the difficulties, I wish to repeat the substance of a portion of my report read at the meeting of the board of regents, in June, 1886.

What has the industrial college done for the student in agriculture?

What has it done for the young man who wishes to obtain an agricultural education? Allow me to make a formal enumeration, as follows:

1. It has provided a full course of study in those branches of learning which are related to agriculture, in which there is not only more science, but also more of the practical application of the science than is to be found in any similar course in any agricultural college with which I am acquainted. I know of no case in which there is provided as much agriculture, horticulture, and veterinary instruction as we now offer in the agricultural course of this college. This course, moreover, is just as severe as any other in the university. Its training is fully as thorough as that of any of the courses in the academic college.

2. It has provided, also, an elementary course in agriculture, two years in length, to which admission is granted on very easy terms. The candidate may enter this course directly from the country school, and is at once admitted to classes in elementary botany, zoology, and agriculture. The first year's studies can not fail to prove of great

value to every young man intending to spend his life on the farm. And the completion of the two years' course will give him such a knowledge of the elements of the sciences, and of their applications, as will be of much service to him in his future career.

3. It has provided rooms for students who wish to board upon the college farm, and does not charge rental for them. It maintains a table where board is furnished at cost.

4. It supplies work to such students, thus enabling them to defray a part of their expenses.

5. For the student who prefers to live in the city during the college year, there are numerous opportunities for engaging in various kinds of labor, many students in all classes partly paying their expenses in this way.

Now, with all these provisions, why is it that there are not more young men enrolled in the course in agriculture? The following suggestions are worthy of consideration:

When I entered upon my duties in the college, the course in agriculture was a very easy one, into which students could pass who failed in other and more severe studies. That the old course was to a certain extent a sort of "catch-all," into which all the poorer material drifted, there is very good evidence. And there is evidence, moreover, that the result of this policy has been extremely injurious to the reputation of agricultural education in the university, and in the state at large. That course of study in any college or university into which students may drop when they fail in other courses, will inevitably fall into merited disrepute. These facts must be taken into consideration in the inquiry as to the small number of students, and we must remember that a damaged reputation is but slowly mended. It is, perhaps, yet too soon to expect people to have that respect for the present course of study which it merits, and it may take years to entirely undo the harm. When it is fully realized that the student in the agricultural course is doing just as hard work and getting just as much training as the students in any other course, one of the present difficulties will be removed.

It is sometimes suggested that the requirements for admission to the agricultural course are too high, and we have been asked to lower

them in order that young men may more easily gain entrance. In such cases it is forgotten that the branches required are those which may be studied in every well ordered high school in the state. It is not wisdom, it is not economy for the industrial college to duplicate the work which may be done equally well elsewhere. The standard of admission is now full low enough if we hope to make trained men—men who may become teachers and leaders in agricultural science. The longer course of four years is none too long in which to train investigators, and it is certainly none too long to prepare a man for leadership among intelligent and educated farmers; while the shorter course supplies all that can be asked by those who cannot afford to spend so long a time in college. If it is said that some of the agricultural colleges in the country have low conditions of admission, and that they are drawing great numbers of students, I cannot refrain from saying that, in my opinion, based upon many years of observation of such cases, those colleges are doing a great wrong both to the cause of higher education and to the young men pursuing such courses. These colleges offer a short course to a degree. In four years from the common school some of them confer the degree of Bachelor of Science. Beginning lower down in preparation than the requirement for admission to the Latin school of the university, the student is not taught a word of any other language than the English, and but little of that. He is taught from English text-books the elements of the sciences, and is graduated with a degree which elsewhere implies double the preparation and training. It is an unjustifiable lowering of the value of a college degree, and a wrong committed against the young man who is graduated with such poor preparation. He is a Bachelor of Science, but he soon finds that he does not know as much as Bachelors of Science from other colleges and universities. He finds his field limited; he finds himself hampered. He learns after graduation that he has not been equipped for investigation at all. He has simply pursued the text-books of the schools. He cannot read foreign journals; he cannot consult the records of three-fourths of the investigations made in the sciences. He has only the equipment of a second-rate man. Nearly all of science must come to him at second hand, and a large part of the

literature of agriculture, even, must come to him through the translations made by better trained men.

Shall we offer more manual labor? By manual labor in this inquiry is meant labor which is remunerated in money, for we have already made provision for a large amount of practical work in every scientific subject, as well as in those which have usually been denominated the practical subjects. When the student learns chemistry, he handles chemicals for himself, he analyzes substances for himself. In the study of insects he does not get his knowledge by conning a book, but by the observation of the insect itself in the field and garden. He finds for himself, and studies with his own eyes, the injurious fungi which infest the vegetation of the farm, garden, and grove. In the same way provision is made for practical work and observation in the technical agricultural subjects. I do not hesitate to say that it is not this kind of work for which there is further demand. But for paid labor, shall we make more liberal offers, both as to quantity and remuneration? Some of the difficulties are these, viz.: There is not much work on a farm no larger than ours. Such labor can be employed in certain cases only, as in chores and various jobs, but work which demands the whole day of the laborer cannot be accomplished by students who give but two or three hours at a time. Experience has shown that not more than ten cents per hour can be paid for such work, and anything above this is paid at a loss to the department paying it. Often, indeed, it is impossible to pay even this low rate without loss.

In view of these difficulties, I know of but one method of providing more labor of this kind, and that is by adopting the plan pursued in Michigan, where a special appropriation is made for the purpose of maintaining regular manual labor. Were this done, the care of the botanic garden, the trees, hedges, walks, and flower beds about the buildings, and like work upon the farm, would furnish instructive and remunerative employment to many a deserving young student. I am convinced, after long reflection upon this matter, that it would be a wise action for the legislature to provide this college with a manual labor fund for the benefit of the students in the course in agriculture.

I will not now discuss the need of more extended illustrative work

in agriculture and horticulture, and of the need of more experimentation, and their relation to an increased patronage of the agricultural course by the young men of this state. It is admitted that there should be such extensions of the college work, and I trust that the legislature will soon make the necessary appropriations therefor.

Do the people know what this Industrial College can do in the way of giving an agricultural education? From the experience of the past two years I am led to think that one great difficulty in the support of the agricultural course is that the people do not yet generally know what we can offer. Even in the vicinity of this city, many people do not yet know that the course of study is made equally honorable with the other courses. But few know of the kind of instruction given in the sciences. They do not know how closely such knowledge bears upon the work of every-day life. Nor do they yet know of the improved condition of the college farm, and of the efforts being made to rescue it from the disrepute into which it has fallen. It is hoped that ere long the people of the state will have more abundant opportunities for learning of the advantages offered by this college to the young men who propose to follow rural pursuits, or who wish to fit themselves for investigators and teachers of agricultural subjects.

III. THE FUTURE: PLANS AND NEEDS.

In order that the development of the Industrial College may be symmetrical, and worthy of the great industrial interests it represents, it must be constantly borne in mind that we have as yet but made a beginning of the work. Whatever has been accomplished, however much it may be, is but the foundation of the great superstructure which we are slowly building.

Civil Engineering.—It is very necessary that this department should have greatly increased facilities in the way of instruments, tables, cases, and other apparatus. In the near future the allied department of mechanical engineering must receive recognition and be provided with a proper outfit. This will prove of great service to the department of civil engineering, the shops supplying opportunities for certain kinds of practical work now unprovided for.

Physics.—The relations of physics to the many applications of science, make it imperative that this science should receive the fullest development in this college. Civil and mechanical engineering are closely dependent upon it, while the new branch of applied science, electrical engineering, is in fact a direct practical outgrowth from it.

Agricultural Experiments.—It is hoped that year by year a larger number of experiments can be carried on. Plans for these have been made, including the investigation of soil temperatures, the percolation of water through soils (lysimetry), subterranean irrigation, and the problems connected with the question of the most economical feeding of animals. All these require a good deal of time for their completion, and should be commenced at the earliest possible date. It will be necessary to bear in mind the fact that for the feeding experiments and those in lysimetry a good deal of chemical work will be required, and that it will soon be necessary to make provision for work in this branch of the science, *i. e.*, agricultural chemistry.

Horticultural Work.—The immediate future should see the development of the botanic garden from its present small dimensions to something more worthy of the college. Every tree and shrub which will endure this climate should be found in it, plainly labeled, with both the scientific and English names. There should be, also, upon the farm extensive plantings of those fruit trees which have been shown to be the most desirable for growth for timber and fuel. It is fitting that we should have upon this state farm a creditable example of what a forestry plantation should be.

In connection with these suggestions as to horticultural work, I should like to urge that such assistance be furnished to the professor of geology and allied sciences as will make possible the development of economic entomology in his department, a thing not now possible simply for want of time. No training in horticulture can be considered as complete which does not include a thorough course in economic entomology, and the fullest provision should be made for it.

The proposed Veterinary School.—Throughout nearly the whole biennium suggestions have come to us that there should be a veterinary school in the Industrial College, for the benefit of that great class of

agriculturists in this state whose farming finds its highest work in the growing of stock. A year ago the regents appointed a committee to inquire into the expediency of taking steps toward the establishment of such a school. This committee consulted with the State Agricultural Society, the Nebraska Fine Stock Breeders' Association, and with many prominent men in the state, and finally reported that there appeared to be a demand for such a school.

At the spring meeting of the regents (in 1886) I presented a plan of action as to the proposed school, essentially as follows:

1. That a competent man be appointed at once to begin the work of investigation of animal diseases, and to mature plans for a veterinary school.

2. That the legislature be asked to make provision for the establishment of a first-class veterinary school, including

- (a) A veterinary building,
- (b) Proper buildings and enclosures on farm,
- (c) Apparatus,
- (d) Salaries of three or four professors,
- (e) Current expenses.

In accordance with the first part of the plan outlined above, Dr. F. S. Billings was appointed, and has been for some months engaged in investigations, and in the study of plans for the school.

I am but doing my duty to the great stock-growing industry of this state when I express my settled conviction that the legislature will act wisely in making liberal provisions for a veterinary school.

Military Instruction.—The act of Congress making provision "for the benefit of agriculture and the mechanic arts," under which the Industrial College was founded, expressly requires that military instruction shall be included in its work. This requirement is imperative, and cannot be evaded. It rests, therefore, with the state to make proper provision for this important branch.

CHARLES E. BESSEY,

Dean of the Industrial College.

December, 1886.

LIST OF STUDENTS IN THE INDUSTRIAL COLLEGE.

SENIORS.

Edmund D. Howe, *Table Rock.*

SOPHOMORES.

Ernest George Eagleson, *Craig.*

Charles Marvin French, *Rulo.*

Hervey Bryan Hicks, *Lincoln.*

Frank Austin Manley, *Lincoln.*

Harvey Eden Shotwell, *Lincoln.*

FRESHMEN.

Ralph Platt, *Grand Island,*

Conrad Frederick Scharmann, *North Platte.*

Lewis Herbert Stoughton, *Ogden, Iowa.*

George Henry Tinker, *Lincoln.*

Albert Melville Troyer, *Dorchester.*

SPECIALS.

Earl Benton, *Rockwell City, Iowa.*

Otto August Bischof, *Nebraska City.*

Gilbert Horace Ellsworth, *Red Wing.*

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